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PSYCHOLOGY AND PHILOSOPHY.

I.—IS POSITION IN TIME AND SPACE ABSOLUTE OR RELATIVE?

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THE purpose of the present paper is to reopen a discussion which has been generally regarded as definitively closed. We have all been taught to believe that time and space consist wholly of relations, and that moments and points are mathematical fictions. It is this opinion that I wish to challenge. I shall endeavour to state, as precisely as possible, both the absolute and the relative theory in each case; to show that, in the case of time, provided we take any account of facts, it is difficult, if not impossible, to free the relational theory from contradiction; to prove that, in the case of space, the relational theory must be so modified, if it is to be logically permissible, as to lose all the advantages which it claims over the absolute theory; and finally, by an examination of Lotze's arguments against absolute space, to demonstrate the falsity of the logic from which these arguments are derived. The discussion has to be conducted differently in the two cases of space and time. The paper, therefore, will consist of three parts: the first will be concerned with time, the second with space, and the third with Lotze's arguments concerning space. I shall not be concerned directly with the existence of space and time, but only with their logical analysis: that is, I shall not raise the question whether what appears to exist in space and time is mere appearance,

but only the question what space and time must be if what appears to occupy them does exist. It should be observed, however, that, if I succeed in constructing a logically permissible account of space and time, the chief reason for regarding their contents as mere appearance is thereby destroyed.

With regard to time, I assume that there is some definite series whose relations are temporal, *i.e.*, some series such that any two of its terms are either simultaneous, or are one before and the other after. This series is one-dimensional, and is also *compact*, *i.e.*, if A be before B, there is some term C which is before B and after A. With regard to such series in general, we may distinguish two theories, the absolute and the relative.[1] In the absolute theory, we have two classes of entities, (1) those which *are* positions, (2) those which *have* positions. Any two terms of the first class have an asymmetrical transitive relation: in the present case, either *before* or *after*. The terms which have positions are terms each of which has, to one or more of the terms which are positions, a certain specific relation, which may be expressed by saying that the new terms are *at* the positions, or that they occupy the positions. By compounding a term which has one or more positions with one of the positions which it has, we obtain a complex term, *i.e.*, the said term at the position; this new complex term contains the position as a constituent, but contains only one such position. In the case of time, two such terms which contain the same moment as constituent are said to be simultaneous; two which contain different moments are *said* to be one before and the other after, by correlation with the moments they contain, but this new relation of before and after is complex, containing as a constituent the before and after of moments. We may call *qualities* the terms which have positions in time; thus a quality may be at many moments, or even at all moments. The compound formed of a quality at a time may be called an *event*; thus an event is logically incapable of recurrence. Two events are simultaneous when both are qualities *at* one time; otherwise they are successive. We have thus three simple relations, *before*, *after* and *at*. Before and after are transitive and asymmetrical, *at* is intransitive and asymmetrical. The relation of an event to its moment, which is derivative, is also intransitive and asymmetrical; moreover it is, unlike *at*, a many-one relation: *i.e.*, though many events may be in a moment, there is only one

[1] See MIND, January, 1901, p. 35.

moment in which a given event can be. This is the absolute theory of time.

In the relational theory we do not require two different classes of entities, but we still require three simple relations. We have here a single class of entities, which may be called events, any two of which have one and only one of three unanalysable relations, simultaneity, priority and posteriority. All three are transitive; the first is symmetrical, while the other two are asymmetrical. Further, if A be simultaneous with B, and B be before C, A is before C; and if B be after C, A is after C. (These two properties are independent.) This is the relational theory.

The relational theory may seem, at first sight, simpler than the absolute theory, but in its application a great difficulty arises from the absence of any such class of entities as the events which it requires. Before developing this difficulty, we must observe that simultaneity must be strictly unanalysable. If two events were simultaneous because they had some common property not shared by events not simultaneous with them, the collection of all such common properties of different groups of simultaneous events would have exactly the characteristics by which we defined absolute time. Now for my part I consider it self-evident that all symmetrical transitive relations are analysable; and if this axiom were admitted, the relational theory would fall at once. But as my opponents will allow no such principle, I shall not appeal to it in what follows.

When we begin the search for events answering to the above definition, we are met by the following difficulty. Whatever can, in ordinary language, recur or persist, is not an event; but it is difficult to find anything logically incapable of recurrence or persistence, except by including temporal position in the definition. When we think of the things that occur in time—pleasure, toothache, sunshine, etc.—we find that all of them persist and recur. In order to find something which does not do so, we shall be forced to render our events more complex. The death of Cæsar or the birth of Christ, it may be said, were unique: they happened once, but will never happen again. Now it is no doubt probable that nothing exactly similar to these events will recur; but, unless the date is included in the event, it is impossible to maintain that there would be a logical contradiction in the occurrence, in the future, of a precisely similar event. Perhaps it may be said that the whole state of the universe has the required uniqueness: we may be told that it is logically impossible for the universe to be twice in the same

state. But let us examine this opinion. In the first place, it receives no countenance from science, which, though it admits such recurrence to be improbable, regards it as by no means impossible. In the second place, the present state of the universe is a complex, of which it is admitted that every part may recur. But if every part may recur, it seems to follow that the whole may recur. In the third place, this theory, when developed so as to meet the second objection, becomes really indistinguishable from that of absolute position. There is no longer an unanalysable relation of simultaneity: there are a series of states of the universe, each of which, as a whole and only as a whole, has to each other a simple relation of before and after; an event is any part of a state of the universe, and is simultaneous with any other part of the same state, simultaneity meaning merely the being parts of some one state; before and after do not hold between events directly, but only by correlation. Thus the theory in question, except for the fact that *at* is no longer simple, is merely the absolute theory with states of the whole universe identified with moments. The reasons against such an identification are, first, that events seem to have an order which does not, in its very meaning, involve reference to the whole universe, and secondly, that immediate inspection seems to show that recurrence of the whole state of the universe is not logically absurd.

If the advocate of the relational theory abandons the search for events with a unique temporal position, and confines himself to what, in the absolute theory, we called qualities, he will find it impossible to obtain a time-series at all. In this view, we endeavour to obtain events by means of the mutual relations of qualities, but this endeavour is frustrated by the fact that simultaneity, priority and posteriority are no longer mutually incompatible. It is necessary now to hold that qualities as such have temporal relations. Thus if I feel first pain and then pleasure, we shall be forced to hold that pain as such precedes pleasure as such. We cannot say that this sequence occurs now, but not always, for *now* is constituted by its contents, of which the pain and the pleasure form part. And we have already seen that it is useless to take qualities more complex than pleasure. But we must also admit that pleasure precedes pain, and that pleasure and pain are simultaneous; for these cases also occur. But this destroys the whole time-series, which depends, as all series do, upon the mutual incompatibility of its constitutive relations. The *now* is wholly vague, for among the qualities simultaneous with a given quality, many, if not

all, will also be prior or posterior to it; if the quality be one which persists or recurs, all qualities simultaneous with it must also be prior and posterior to it. Thus the whole time-series collapses: the passage from events to qualities cannot be made, and the edifice of temporal propositions crumbles.

The same argument may be put as follows. It must be admitted that there is some class of entities for which simultaneity is transitive. If A, B, C be such entities, and A and B, B and C are simultaneous, so are A and C. But among qualities this does not hold. For qualities may recur, and recurrence can only mean, on the theory in question, simultaneity with qualities not simultaneous with one another. This contradicts our principle, and shows that it is not between qualities as such that temporal relations hold. In short, if terms which are not positions are to be arranged serially by means of three relations, all transitive and two asymmetrical, while the third is symmetrical, then these three relations must be mutually incompatible. This condition is satisfied by events, but not by qualities. It is impossible, however, owing to the fact of recurrence, to pass from qualities to events without assuming moments. We may divest the argument of all temporal reference, and our result is then seen to be at once demonstrable and obvious. It is as follows: When a collection of terms are capable of serial arrangement, but some among them occur in several positions in the series, then the terms in question form a series which is not independent, but is obtained by some many-many or one-many relation which each of them has to one or more terms of some independent series.

In regard to space, no such simple argument is possible. For this there are three chief reasons. (1) There are, apparently, no existents in space which are not also in time, whereas mental qualities are in time, but are often held to be not in space. (2) It cannot be taken as a self-evident premiss that two things or qualities may have a symmetrical transitive relation such as would be called occupation of the same place, whereas it is evident that two events may be simultaneous. (3) Common sense recognises no entities having a fixed position in space, as events have in time: there is in space nothing corresponding to dates, but all things in space are held to be perpetually in motion. To these must be added, as a minor cause of difficulty, the greater complexity introduced by dimensions. For these reasons, a direct proof of absolute position, from premisses universally admitted, will not be found in what follows, though it is possible that such a proof may be discoverable. Nevertheless, I shall give

grounds for thinking that the relational theory leads to paradoxical results, and that it needs emendations which rob it of the merits that have endeared it to philosophers. When this has been done, I shall endeavour to refute the current refutations of the absolute theory.

The first requisite—though it is one which is universally neglected—is to set forth precisely the two theories which are to be compared. And since it is in the detailed development that the relational theory mainly shows its weakness, it seems necessary to give a fairly full statement of what space is on the two theories. For this purpose, I shall assume that space is Euclidean or hyperbolic—an assumption which does not affect the present argument.

In the absolute theory, a space is a class of entities, called *points*, and having relations of a certain type. The type is somewhat complicated, but may be set forth as follows: Any two distinct points have one and only one asymmetrical transitive relation of a certain class; the converse relation also belongs to the class, and no relation of the class holds between anything except points. If a and b, c and d, be pairs of points having the same relation of the class in question, then a and c, b and d also have this relation or its converse. All the points forming what may be called the extension of a given relation of the class are a series which is endless and compact (*i.e.*, has a term between any two). Such a series is called a *straight line*. It follows from what has been said that the converse relation defines the same straight line, and that two lines cannot have more than one point in common. There are points not on a given straight line. If ab be a given straight line, c a point not on ab, e a point on ab, and d a point on ce such that e is between c and d, then the class of points x, such that either x lies on ab, or cx meets ab in a point between c and x, or dx meets ab in a point between d and x, is called the *plane abc*. If a, b, c be any three non-collinear points, and g be a point between b and c, e a point between a and g, then there is a point f which is between a and c, and between which and b the point e is. Also if f is given between a and c, there is a point e between a and g and between b and f, which is the converse of the former property. Hence it follows that a plane is determined by any three of its points, and contains the line joining any two of its points. But given any plane, there will be points outside the plane. Proceeding to define a three-dimensional figure as the plane was obtained from the straight line and the point, this new figure will contain all points.[1] It remains to add the metrical

[1] The above is obtained from Peano, *Sui Fondamenti della Geometria*, *Rivista di Matematica*, iv., p. 51 ff.

properties of our space. The stretch of points between two given points has a certain magnitude; from any given point, and in either direction along any given line through the point, there is one and only one stretch equal to any given stretch; if $a_0\,a_1$, $a_1\,a_2$, . . . $a_{n-1}\,a_n$ be n equal stretches along the same straight line, and d be any given stretch, then, for some finite value of n, $a_0\,a_n$ will be greater than d; if a_0, a_n be any two points, and n any finite integer, there are n-1 distinct points $a_1, a_2, \ldots a_{n-1}$ on the line $a_0\,a_n$, such that the stretches $a_0\,a_1$, $a_1\,a_2$, . . . $a_{n-1}\,a_n$ are all equal. In virtue of our previous assumptions, the defining relations of the lines in a plane through a point form a closed series; a stretch of such relations is called an angle; three assumptions similar to the three concerning stretches of points are required for angles. A few more axioms are required for triangles, areas and volumes; but these need not be here enumerated.[1]

The absolute theory of space asserts that there are entities (points) which answer to the above description, and that the spatial relations in the actual world hold primarily between points, and only by correlation between the contents of space. It may be observed that, complicated as the above account is, it introduces only two indefinables, namely the class *point* and the class of relations by which straight lines are defined. Magnitude of divisibility may be regarded as a third indefinable introduced by metrical geometry, but this is a general logical notion which has no special reference to space.

A detailed statement of the relational theory, comparable to the above statement of the absolute theory, has never been attempted. Let us first endeavour to characterise generally the points in which the relational theory differs from the above, and then, if possible, to state this theory with all the requisite detail.

There are two main differences of the two theories. First, the relational theory holds that there are no entities which, as such and timelessly, have certain spatial relations, but that all spatial relations involve reference to some time at which they hold between some given pair of entities. Even if there be a pair of entities whose spatial relations are unchanging, we can only say that they happen to have these relations at all times, not that they have them timelessly. Or, if we allow that two entities may have a given spatial relation eternally, we shall have to allow also that, as an eternal relation, the relation in question is not incompatible with another which becomes incompatible with it when the time

[1] See Pasch, *Neuere Geometrie*, Leipzig, 1882, § 13.

is taken into account. That is, if we allow that two material points may be eternally a yard apart, we must allow that they may also be eternally two yards apart, and that, from a given eternal relation, nothing can be inferred as to the relation at any given time. Secondly, the relational theory endeavours to dispense with all such entities and relations as are completely indistinguishable and impossible for us to identify. Thus distances, angles, areas, and volumes are more or less sensible, and are (within limits) capable of recognition. But individual points, straight lines, and planes are wholly impossible to recognise. It is not theoretically possible to discover, by immediate inspection, whether the part of space which I see now is the same as or different from the part which I saw at this time yesterday. The relational theory aims at dispensing with all this apparatus of indistinguishable and unrecognisable entities. This second point forms the motive of the theory, while the first seems to constitute its logical definition. I shall endeavour to show that the facts render it impossible wholly to satisfy the motive, and that a relational space according to the definition must still retain material points which, though capable of motion, are not assumed to exist, which will be as unrecognisable as the points of the absolute theory.

In the relational theory, space consists solely of relations; the terms of these relations are therefore non-spatial. Considered merely as terms of spatial relations, they may be called material points. The spatial relations of material points are to be, if possible, all comprised under distance, rectilinear angle, angle between planes, solid angle, area and volume, right and left. Advocates of the relational theory never (so far as I know) mention any relation except distance, but it is to be supposed that they would mention the others if they condescended to details. Any pair of material points has, at a given instant, one and only one distance; any three have three and only three angles, which are, like *between*, relations of one term to two others. Three particles also have one and only one area at a given time. Four particles have one and only one volume, four and only four solid angles, and six and only six angles between planes. All these relations are quantities, and all fulfil the three axioms (or their analogues) mentioned, as regards stretches, in the statement of the absolute theory. Finally, if four material points be such that the four solid angles which they determine are not all zero, then any two of the four have to the remaining two one or other of two symmetrical relations, which may be called right- and left-handedness: these are such that, if one

of them holds between *ab* and *cd*, the other holds between *ab* and *dc*; further, in respect to these relations, motions are not continuous, *i.e.*, if *a*, *b*, *c*, be fixed, and *d* movable, *ab*, *cd* may suddenly cease to have either of the two relations, and may, by a further motion of *d*, however small, acquire the opposite relation to that which they had before.[1]

The above outline must now be filled in in detail. Let us begin with distances. In the first place, we may inquire whether distances are symmetrical or asymmetrical. In this inquiry, we must remember that we are not yet in possession of the straight line, so that a given distance cannot be specified as being in a given direction. Thus there may be any number[2] of particles whose distance from a given particle at a given instant is a given distance: this must, in fact, be set up as an axiom. But we cannot infer the distance of two particles from their distances from a third particle. A distance is neither a transitive nor an intransitive relation: if *a* and *b*, *b* and *c* both have a given distance, this may or may not be the distance of *a* and *c*. It seems then that, so long as the straight line has not been obtained, distances must be taken as symmetrical, *i.e.*, the distance of *a* from *b* is the same as that of *b* from *a*. Distances, moreover, must be a kind of magnitudes forming an endless compact series. If the zero of distance be included, distances are a series which has one end; but it must be set up as an axiom that the distance of two distinct material particles is never zero.

The next point to be considered is the nature of angles. Angles are not relations between distances, since they may change when distances remain constant, and remain constant when distances change. They might, it is true, be taken as relations of *three* distances, but it would still be necessary to specify the distances as forming a triangle, which imposes upon our distances limitations of an unknown nature. For until we have the straight line, we cannot add distances, and therefore we cannot say that, in a triangle, two distances together must be greater than the third. Thus it seems best to regard angle as a new fundamental relation of three particles. Between three particles *a*, *b*, *c*, there are to be always three angles, which may be regarded as relations of *a* to *b* and *c*, *b* to *c* and *a*, *c* to *a* and *b* respectively. These relations are to be symmetrical as regards the extremes, *i.e*, the angle which is a relation of *a* to *b* and *c* may be regarded

[1] The reader who is not interested in semi-mathematical details may omit the next three paragraphs with advantage.

[2] "Any number" means here any cardinal number not exceeding that of the continuum.

as a relation of a to c and b, and denoted by *bac* or *cab* indifferently. But the relation of the mean to the extreme is to be asymmetrical, *i.e.*, we must not interchange a and b or a and c in the above case. All angles are to be magnitudes, and the series of these magnitudes is to be compact, but unlike distances, it is to have two ends. One of these ends is the zero of angle, which, unlike the zero of distance, may actually hold between distinct particles. This case is specially important, and several axioms are required for dealing with it. If a, b, c, etc., be all mutually distinct, it may happen that the angles *bac* and *bca* are both zero. In this case the angle *abc* will be the maximum of angle, which will be called two right angles. If d and e be points such that *bdc* and *bea* are both zero, then *dbc* and *eba* are both two right angles; also *bda* or *bad* will be zero, and *bad* or *bda* will be two right angles; with similar remarks as regards e. Formally, we may set up the following definitions and axioms.[1] If the angle *abc* is two right angles, we say that b is between a and c. The relation of *between* has the following properties. Neither a nor c is between a and c, but so long as a and c are distinct, there always may be material points between them, and there always may be material points between which and b lies the material point a. The points a and b, the points (if any) between them, the points x (if any) such that a lies between x and b, and the points y (if any) such that b lies between y and a, are said to lie on the *straight line ab*, and no other points are said to lie on this straight line. If a, d be material points, c a material point between them, and b a material point between a and c, then b is between a and d. If b and c be between a and d, then either b is between a and c, or b is identical with c, or b is between c and d. If b lies between a and c, and also between a and d, then either c and d coincide, or c lies between b and d, or d lies between b and c. If b lies between a and c, and c between b and d, then c lies between a and d. These properties are axiomatic, and mutually independent. From all of them together, but not from any selection of them, it results that the material points on one straight line, however numerous they may be, provided there are more than two, form a series. In virtue of our axioms concerning the connexion of maximum and minimum angles, we may define the straight line, in place of the former definition, as follows: The point c is collinear with a and b when the angle *acb* is either zero or two right angles. A further axiom is needed,

[1] *Cf.* Peano, *Rivista di Matematica*, iv., p. 55.

namely: if c be between a and b, the stretches ac, cb are both less than ab.

The above properties are sufficient to characterise maximum and minimum angles. But new axioms are required for dealing with other angles. To begin with, if a, b, c be any three non-collinear points, and d a point between a and c, the angle dab is the same as the angle cab. Next, if b, c, e be collinear, and c be between b and e, and a be a point not on the line bc, then the angle bae is greater than either of the angles bac, cae. By means of these axioms, we are able to arrange serially all such lines through a as contain material points on some line not through a, and to show that, if the same lines can be arranged serially by reference to some other line not through a, the order will be unchanged. But we cannot show that *all* lines through a and in one plane form a series, for some triads of them may not have material points on any one given line.

The development of the theory of planes, angles between planes, and solid angles would be extremely complicated, and I shall not undertake it. I shall content myself with a few remarks on areas and volumes. Three material points have at any instant a certain relation called their *area*. This relation is a magnitude, which, in Euclidean space, has no maximum, but which always has a zero. The relation of the kind in question between three collinear points is a zero area. Area is symmetrical with respect to the three terms of the relation. If a, b, c be three non-collinear points, and d a point between b and c, the area abc is defined to be the sum of abd and acd. Similarly if a', b', c', d' be four points in one plane, no three of which are collinear, and there is a material point e' between a' and c' and also between b' and d'; if, further, $a'b'c'$ be equal to our former area abd, and $a'd'c$ to our former area acd, then it is said that a', b', c', d' determine an area equal to abc. But if it should happen that there is no such material point as e', and if neither the stretches $a'b'$, $c'd'$ nor the stretches $a'd'$, $b'c'$ have a common material point e'; or if, though e' exists, there are not, and never have been, and never will be, four material points a, b, c, d satisfying the above conditions; then we cannot say that a', b', c', d', determine an area at all. Moreover we shall need an axiom to assure us that the area $a'b'c'd'$ so defined is the same as the area obtained by summing $b'a'd'$ and $b'c'd'$. Similar remarks apply to polygons of more than four sides. As regards circles, or other curvilinear figures, they can have no area at all; for their area could only be the limit of a sum of a continually increasing number of continually diminishing triangles, and

the conditions for the method of limits are here not fulfilled, since nothing can be *merely* a limit. As regards volumes, we must make precisely similar remarks.

I have now done my best to state precisely some of the more important parts of the relational theory. It will be admitted that its complexity is bewildering. But what is more important is, that it compels us either to abandon many of the usual propositions of geometry, or to allow the notion of *possible* material points. I have hitherto excluded this notion, and I shall continue to do so until the consequences of such exclusion have been examined. We have just seen that only triangles always have areas, and only tetrahedra always have volumes. This is one result which flagrantly contradicts both geometry and common sense. To maintain that a sphere has no volume and a circle no area is surely to condemn the theory from which such consequences follow. Another similar difficulty arises concerning the intersection of straight lines. If two lines ab, cd intersect, that must mean, on the relational theory, that there is now a material point e collinear both with a and b and with c and d. But geometrically, the question whether there is an intersection depends only upon a, b, c, and d, and not upon the empirical existence of some fifth point e. Thus it is an axiom which is essential to geometry that, if a, b, c, d be four points in a plane, either ab, cd, or ac, bd, or ad, bc intersect. Without this axiom, Euclid's seventh proposition cannot be proved. (Euclid's pretended proof, it may be observed, is worthless.) But when an intersection is taken to be a material point, it is plain that no such axiom can be set up. Hence we shall have to take the seventh proposition as an axiom. And the distinction, which must be recognised, between lines which intersect and lines which do not intersect, becomes impossible to state. The same thing appears in regard to points on a line. There is certainly some sense in which it is always true that there *may* be a material point between any two; but on our present theory it is hard to see what this sense can be. The serial arrangement of the lines in a plane through a point, or of the planes through a line, also fails to be general when we confine ourselves to actual material points. These and many analogous respects, in which the relational theory fails, could not be detected formerly, because the axioms of geometry had not been carefully scrutinised; for example, it is only very recently that the order of points, lines, or planes, has been seen to require special axioms. In some sense, it is plain, space is a plenum; that is, there are entities which have any spatial

relation that is possible. But we cannot make these entities actual material points, since, even if there are actual material points everywhere, this is a purely empirical fact, which cannot be invoked as an escape from a logical difficulty.

It remains to examine the notion of possible material points. Since, in the relational theory, all spatial relations hold, not eternally, but at times, the possible material points, if they are to be geometrically useful, must be in time, and they must have changing spatial relations to actual material points. The actual points, in fact, must be merely those among the possible ones which happen to exist. It must be set up as an axiom that, if *a*, *b* be any two possible or actual material points, there is a possible material point between them; and so on. But now we must ask ourselves what reason we have for assuming such possible points at all. We have now a set of spatial relations, all of which always hold between entities, actual or possible, and whose change from time to time consists solely in the fact that it is between different entities that they hold. Given a collection of geometrical relations all belonging at one time to one particle, this collection will belong at every time to some particle. Moreover the collection of geometrical relations belonging to one particle at one time is exactly identical with the collection belonging to the same or any other particle at the same or any other time; for all possible distances, angles, etc., are at all times relations of any given particle to other particles. Motion consists merely in the fact that the same relations which *a* has at one time to (say) *b*, *c*, *d*, etc., it has at another time to (say) *c*, *d*, *b*, etc. That is, the same relations are, as it were, differently shuffled; and this constitutes all that motion can mean. In this notion there is, so far as I can see, nothing self-contradictory, provided it be admitted that a non-existent may be in time and have changing relations. But it must be admitted that the introduction of non-existent material points as an essential part of geometry destroys the plausibility of the relational theory, and renders it no longer able to content itself with data that are in some degree sensible. It seems, at this stage, merely a natural simplification to suppose that there are spatial points, between which primarily spatial relations hold, and *at* some or all of which there are at any given time material points. And then all spatial relations except right and left become definable in terms of *at* and straight lines.

We have now seen that the relational theory, if it confines itself to actual material points, is unable, since the question as to the geometrical distribution of such points must be

empirical, to give an account, which will consist with the facts, of the intersection of geometrical figures, the order of lines and planes, and the nature of areas and volumes. If it invokes other material points, not assumed to exist, but regarded as entities related to time and to existent material points as these are related to time and to each other, it becomes logically admissible, but loses whatever advantage it may possess over the absolute theory. And however we develop it, the complications which it introduces are so great that the mere enumeration of axioms becomes a herculean task. When we come to motion, the additional complications become infinitely greater, since the motion of one particle can only be specified by the changes in its relations to *all* other particles; whereas, in the absolute theory, the motion is specified by the mention of the points at which the particle is at the two times. And there is a special argument, derived from dynamics, to show that the straight line must be an independent relation, not, as in the relational theory, derivative from the collinearity of three particles. This is the argument from what is called absolute rotation, which I have omitted because it demands a long discussion of the laws of motion. But this argument alone, in my opinion, suffices, in the absence of logical grounds on either side, to turn the scale in favour of absolute position.

I come now to the third section of my paper, in which I shall endeavour to answer the current arguments against absolute position. If it can be shown that there are no *a priori* arguments on either side, simplicity and the dynamical argument should decide in favour of the absolute theory. The arguments against this theory are, in my opinion, one and all fallacious. They are best collected in Lotze's *Metaphysic* (§ 108 ff). They are there confused with arguments for the subjectivity of space—an entirely distinct question, as should have been evident from the fact that Kant, in the *Critique*, advocated the theory of absolute position.[1] Omitting arguments only bearing on this latter point, we have the following summary of Lotze's arguments against absolute space.

(1) Relations are only either (α) as presentations in a relating consciousness, or (β) as internal states in the real elements which are said to stand in these relations (§ 109).

(2) The being of empty space is neither the being which works effects (which belongs to a thing), nor the mere validity of a truth, nor the fact of being presented by us. What kind of being is it then? (§ 109).

[1] *Cf.* Vaihinger, *Commentar*, pp. 189-190.

(3) All points are exactly alike, yet every pair have a relation peculiar to themselves; but being exactly like every other pair, the relation should be the same for all pairs (§ 111).

(4) The being of every point must consist in the fact that it distinguishes itself from every other, and takes up an invariable position relatively to every other. Hence the being of space consists in an active mutual conditioning of its various points, which is really an interaction (§ 110).

(5) If the relations of points were a mere fact, they could be altered, at least in thought; but this is impossible: we cannot move points or imagine holes in space. This impossibility is easily explained by a subjective theory (§ 110).

(6) If there are real points, either (*a*) one point creates others in appropriate relations to itself, or (*β*) it brings already existing points into appropriate relations, which are indifferent to their natures (§ 111).

(1) All these arguments depend, at bottom, upon the first, the dogma concerning relations. As it is of the essence of the absolute theory to deny this dogma, I shall begin by examining it at some length.[1] "All relations," Lotze tells us, "only *are* as presentations in a relating consciousness, or as internal states in the real elements which, as we are wont to say, stand in these relations." This dogma Lotze regards as self-evident, as indeed he well may; for there is not one anterior philosopher, unless it be Plato, who does not employ the dogma as an essential part of his system. To deny it, therefore, is a somewhat hardy undertaking. Let us, nevertheless, examine the consequences to which the dogma leads us.

It would seem that, if we accept the dogma, we must distinguish two kinds of relations, (*a*) those which are presentations in a relating consciousness, and (*β*) those which are internal states of the elements supposed to be related. These may be ultimately identical, but it will be safer in the mean time to treat them as different. Let us begin with those which are only presentations in a relating consciousness. These presentations, we must suppose, are beliefs in propositions asserting relations between the terms which appear related. For it must be allowed that there are beliefs in such propositions, and only such beliefs seem capable of being regarded as presentations in which relations have their being. But these beliefs, if the relations believed

[1] The logical opinions which follow are in the main due to Mr. G. E. Moore, to whom I owe also my first perception of the difficulties in the relational theory of space and time.

to hold have no being except in the beliefs themselves, are necessarily false. If I believe A to be B's father, when this is not the case, my belief is erroneous; and if I believe A to be west of B, when westerliness in fact exists only in my mind, I am again mistaken. Thus this first class of relations has no validity whatever, and consists merely in a collection of mistaken beliefs. The objects concerning which the beliefs are entertained are as a matter of fact wholly unrelated; indeed there cannot even be *objects*, for the plural implies diversity, and all beliefs in the relation of diversity must be erroneous. There cannot even be one object distinct from myself, since this would have to have the relation of diversity to me, which is impossible. Thus we are committed, so far as this class of relations goes, to a rigid monism.

But now, what shall we say of the second class of relations, those namely which are reducible to internal states of the apparently related objects? It must be observed that this class of relations presupposes a plurality of objects (two at least), and hence involves the relation of diversity. Now we have seen that, if there be diversity, it cannot be a relation of the first class; hence it must itself be of the second class. That is, the mere fact that A is different from B must be reducible to internal states of A and B. But is it not evident that, before we can distinguish the internal states of A from those of B, we must first distinguish A from B? *i.e.*, A and B must *be* different, before they can have different states. If it be said that A and B are precisely similar, and are yet two, it follows even more evidently that their diversity is not due to difference of internal states, but is prior to it. Thus the mere admission that there are internal states of different things destroys the theory that the essence of relations is to be found in these states. We are thus brought back to the notion that the apparent relations of two things consist in the internal states of one thing, which leads us again to the rigid monism implied in the first type of relation.

Thus the theory of relations propounded by Lotze is, in fact, a theory that there are no relations. This has been recognised by the most logical adherents of the dogma—*e.g.*, Spinoza and Mr. Bradley—who have asserted that there is only one thing, God or the Absolute, and only one type of proposition, namely that ascribing predicates to the Absolute. In order to meet this development of the above theory of relations, it will be necessary to examine the doctrine of subject and predicate.

Every proposition, true or false—so the present theory

contends—ascribes a predicate to a subject, and—what is a corollary from the above—there is only one subject. The consequences of this doctrine are so strange, that I cannot believe they have been realised by those who maintain it. The theory is in fact self-contradictory. For if the Absolute has predicates, then there are predicates; but the proposition "there are predicates" is not one which the present theory can admit. We cannot escape by saying that the predicates merely qualify the Absolute; for the Absolute cannot be qualified by nothing, so that the proposition "there are predicates" is logically prior to the proposition "the Absolute has predicates". Thus the theory itself demands, as its logical *prius*, a proposition without a subject and a predicate; moreover this proposition involves diversity, for even if there be only one predicate, this must be different from the one subject. Again, since there is a predicate, the predicate is an entity, and its predicability of the Absolute is a relation between it and the Absolute. Thus the very proposition which was to be non-relational turns out to be, after all, relational, and to express a relation which current philosophical language would describe as purely external. For both subject and predicate are simply what they are—neither is modified by its relation to the other. To be modified by the relation could only be to have some other predicate, and hence we should be led into an endless regress. In short, no relation ever modifies either of its terms. For if it holds between A and B, then it is between A and B that it holds, and to say that it modifies A and B is to say that it really holds between different terms C and D. To say that two terms which are related would be different if they were not related, is to say something perfectly barren; for if they were different, they would be other, and it would not be the terms in question, but a different pair, that would be unrelated. The notion that a term can be modified arises from neglect to observe the eternal self-identity of all logical concepts or Platonic ideas, which alone form the constituents of propositions.[1] What is called modification consists merely in having at one time, but not at another, some specific relation to some other specific term; but the term which sometimes has and sometimes has not the relation in question must be unchanged, otherwise it would not be *that* term which had ceased to have the relation.

The general objection to Lotze's theory of relations may

[1] See Mr. G. E. Moore's paper on "The Nature of Judgment," MIND, N.S., vol. viii.

be thus summed up. The theory implies that all propositions consist in the ascription of a predicate to a subject, and that this ascription is not a relation. The objection is, that the predicate is either something or nothing. If nothing, it cannot be predicated, and the pretended proposition collapses. If something, predication expresses a relation, and a relation of the very kind which the theory was designed to avoid. Thus in either case the theory stands condemned, and there is no reason for regarding relations as all reducible to the subject-predicate form.

(2) I come now to the second of Lotze's objections to empty space. This is again of a somewhat abstract logical character, but it is far easier to dispose of, since it depends upon a view more or less peculiar to Lotze. There are, it says, three and only three kinds of being, no one of which belongs to space. These are (α) the being of things, which consists in activity or the power to produce effects; (β) the validity of a truth; (γ) the being which belongs to the contents of our presentations.

The answer to this is, that there is only one kind of being, namely being *simpliciter*, and only one kind of existence, namely existence *simpliciter*. Both being and existence, I believe, belong to empty space; but being alone is relevant to the refutation of the relational theory—existence belongs to the question which Lotze confounds with the above, namely as to the reality or subjectivity of space. It may be well first to explain the distinction of being and existence, and then to return to Lotze's three kinds of being.

Being is that which belongs to every conceivable term, to every possible object of thought—in short to everything that can possibly occur in any proposition, true or false, and to all such propositions themselves. Being belongs to whatever can be counted. If A be any term that can be counted as one, it is plain that A is something, and therefore that A is. "A is not" must always be either false or meaningless. For if A were nothing, it could not be said not to be; "A is not" implies that there is a term A whose being is denied, and hence that A is. Thus unless "A is not" be an empty sound, it must be false—whatever A may be, it certainly is. Numbers, the Homeric gods, relations, chimeras and four-dimensional spaces all have being, for if they were not entities of a kind, we could make no propositions about them. Thus being is a general attribute of everything, and to mention anything is to show that it is.

Existence, on the contrary, is the prerogative of some only amongst beings. To exist is to have a specific relation to

existence—a relation, by the way, which existence itself does not have. This shows, incidentally, the weakness of the existential theory of judgment—the theory, that is, that every proposition is concerned with something that exists. For if this theory were true, it would still be true that existence itself is an entity, and it must be admitted that existence does not exist. Thus the consideration of existence itself leads to non-existential propositions, and so contradicts the theory. The theory seems, in fact, to have arisen from neglect of the distinction between existence and being. Yet this distinction is essential, if we are ever to deny the existence of anything. For what does not exist must be something, or it would be meaningless to deny its existence; and hence we need the concept of being, as that which belongs even to the non-existent.

Returning now to Lotze's three kinds of being, it is sufficiently evident that his views involve hopeless confusions.

(*a*) The being of things, Lotze thinks—following Leibniz here as elsewhere—consists in activity. Now activity is a highly complex notion, which Lotze falsely supposed unanalysable. But at any rate it is plain that, if there be activity, what is active must both be and exist, in the senses explained above. It will also be conceded, I imagine, that existence is conceptually distinguishable from activity. Activity may be a universal mark of what exists, but can hardly be synonymous with existence. Hence Lotze requires the highly disputable proposition that whatever exists must be active. The true answer to this proposition lies (1) in disproving the grounds alleged in its favour, (2) in proving that activity implies the existence of time, which cannot be itself active. For the moment, however, it may suffice to point out that, since existence and activity are logically separable, the supposition that something which is not active exists cannot be logically absurd.

(*β*) The validity of a truth—which is Lotze's second kind of being—is in reality no kind of being at all. The phrase, in the first place, is ill-chosen—what is meant is the truth of a truth, or rather the truth of a proposition. Now the truth of a proposition consists in a certain relation to truth, and presupposes the being of the proposition. And as regards being, false propositions are on exactly the same level, since to be false a proposition must already be. Thus validity is not a kind of being, but being belongs to valid and invalid propositions alike.

(*γ*) The being which belongs to the contents of our presentations is a subject upon which there exists everywhere the

greatest confusion. This kind is described by Lotze as "*ein Vorgestelltwerden durch uns*". Lotze presumably holds that the mind is in some sense creative—that what it intuits acquires, in some sense, an existence which it would not have if it were not intuited. Some such theory is essential to every form of Kantianism—to the belief, that is, that propositions which are believed solely because the mind is so made that we cannot but believe them may yet be true in virtue of our belief. But the whole theory rests, if I am not mistaken, upon neglect of the fundamental distinction between an idea and its object. Misled by neglect of being, people have supposed that what does not exist is nothing. Seeing that numbers, relations, and many other objects of thought, do not exist outside the mind, they have supposed that the thoughts in which we think of these entities actually create their own objects. Every one except a philosopher can see the difference between a post and my idea of a post, but few see the difference between the number 2 and my idea of the number 2. Yet the distinction is as necessary in one case as in the other. The argument that 2 is mental requires that 2 should be essentially an existent. But in that case, it would be particular, and it would be impossible for 2 to be in two minds, or in one mind at two times. Thus 2 must be in any case an entity, which will have being even if it is in no mind.[1] But further, there are reasons for denying that 2 is created by the thought which thinks it. For, in this case, there could never be two thoughts until some one thought so; hence what the person so thinking supposed to be two thoughts would not have been two, and the opinion, when it did arise, would be erroneous. And applying the same doctrine to 1, there cannot be one thought until some one thinks so. Hence Adam's first thought must have been concerned with the number 1; for not a single thought could precede this thought. In short, all knowledge must be recognition, on pain of being mere delusion; Arithmetic must be discovered in just the same sense in which Columbus discovered the West Indies, and we no more create numbers than he created the Indians. The number 2 is not purely mental, but is an entity which may be thought *of*. Whatever can be thought of has being, and its being is a precondition, not a result, of its being thought of. As regards the existence of an object of thought, however, nothing can be inferred from the fact of its being thought of, since it certainly does not exist in the thought which

[1] *Cf.* Frege, *Grundgesetze der Arithmetik*, p. xviii.

thinks of it. Hence, finally, no special kind of being belongs to the objects of our presentations as such. With this conclusion, Lotze's second argument is disposed of.

(3) Lotze's third argument has been a great favourite, ever since Leibniz introduced it. All points, we are told, are exactly alike, and therefore any two must have the same mutual relation as any other two; yet their mutual distances must differ, and even, according to Lotze (though in this he is mistaken), the relation of every pair must be peculiar to that pair. This argument will be found to depend again upon the subject-predicate logic which we have already examined. To be exactly alike can only mean—as in Leibniz's Identity of Indiscernibles—not to have different predicates. But when once it is recognised that there is no essential distinction between subjects and predicates, it is seen that any two simple terms simply differ immediately—they are two, and this is the sum-total of their differences. Complex terms, it is true, have differences which can be revealed by analysis. The constituents of the one may be A, B, C, D, while those of the other are A, E, F, G. But the differences of B, C, D from E, F, G are still immediate differences, and immediate differences must be the source of all mediate differences. Indeed it is a sheer logical error to suppose that, if there were an ultimate distinction between subjects and predicates, subjects could be distinguished by differences of predicates. For before two subjects can differ as to predicates, they must already be two; and thus the immediate diversity is prior to that obtained from diversity of predicates. Again two terms cannot be distinguished in the first instance by difference of relation to other terms; for difference of relation presupposes two distinct terms, and cannot therefore be the ground of their distinctness. Thus if there is to be any diversity at all, there must be immediate diversity, and this kind belongs to points.

Again points have also the subsequent kind of diversity consisting in difference of relation. They differ not only, as Lotze urges, in their relations to each other, but also in their relations to the objects in them. Thus they seem to be in the same position as colours, sounds, or smells. Two colours, or two simple smells, have no intrinsic difference save immediate diversity, but have, like points, different relations to other terms.

Wherein, then, lies the plausibility of the notion that all points are exactly alike? This notion is, I believe, a psychological illusion, due to the fact that we cannot remember a point, so as to know it when we meet it again. Among

simultaneously presented points it is easy to distinguish; but though we are perpetually moving, and thus being brought among new points, we are quite unable to detect this fact by our senses, and we recognise places only by the objects they contain. But this seems to be a mere blindness on our parts—there is no difficulty, so far as I can see, in supposing an immediate difference between points, as between colours, but a difference which our senses are not constructed to be aware of. Let us take an analogy: Suppose a man with a very bad memory for faces: he would be able to know, at any moment, whether he saw one face or many, but he would not be aware whether he had ever seen any of the faces before. Thus he might be led to define people by the rooms in which he saw them, and to suppose it self-contradictory that new people should come to his lectures, or old people cease to do so. In the latter point, at least, it will be admitted by lecturers that he would be mistaken. And as with faces, so with points—inability to recognise them must be attributed, not to the absence of individuality, but merely to our incapacity.

(4) Lotze's fourth argument is an endeavour to effect a *reductio ad absurdum*, by proving that, on the absolute theory, points must interact. The being of every point, Lotze contends, must consist in the fact that it distinguishes itself from every other, and takes up an invariable position relatively to every other. Many fallacies are contained in this argument. In the first place, there is what may be called the ratiocinator's fallacy, which consists in supposing that everything has to be explained by showing that it is something else. Thus the being of a point, for Lotze, must be found in its difference from other points, while, as a matter of fact, its being is simply its being. So far from being explained by something else, the being of a point is presupposed in all other propositions about it, as, *e.g.*, in the proposition that the point differs from other points. Again, the phrase that the point distinguishes *itself* from all other points seems to be designed to imply some kind of self-assertion, as though the point would not be different unless it chose to differ. This suggestion helps out the conclusion, that the relations between points are in reality a form of interaction. Lotze, believing as he does that activity is essential to existence, is unable to imagine any other relation between existents than that of interaction. How hopelessly inapplicable such a view is, will appear from an analysis of interaction. Interaction is an enormously complex notion, presupposing a host of other relations, and involving, in its usual form, the distinction of

a thing from its qualities—a distinction dependent on the subject-predicate logic already criticised. Interaction, to begin with, is either the simultaneous action of A on B and B on A, or the action of the present states of A and B conjointly on their states at the next instant. In either case it implies action. Action generally may be defined as a causal relation between one or more states of one or more things at the present instant and one or more states of the same or different things at the next instant. When there is only one thing in both cases, the action is immanent if the thing be the same in cause and effect, transient if the cause be in one thing and the effect in another. In order to speak of action, rather than causality simply, it is necessary to suppose things enduring for a certain time, and having changing states. Thus the notion of interaction presupposes the following relations: (1) diversity between things; (2) diversity between the states of things; (3) simultaneity; (4) succession; (5) causality; (6) the relation of a thing to its states. This notion, involving, as a moment's inspection shows, six simpler relations in its analysis, is supposed to be *the* fundamental relation! No wonder absurdities are produced by such a supposition. But the absurdities belong to Lotze, not to space. To reduce the relations of points to interactions, on the ground that interaction is the type of all relations, is to display a complete incapacity in the simplest problems of analysis. The relations of points are not interactions, any more than before and after, or diversity, or greater and less, are interactions. They are eternal relations of entities, like the relation of 1 to 2 or of interaction itself to causality. Points do not *assign* positions to each other, as though they were each other's pew-openers: they eternally have the relations which they have, just like all other entities. The whole argument, indeed, rests upon an absurd dogma, supported by a false and scholastic logic.

(5) The fifth argument seems to be designed to prove the Kantian apriority of space. There are, it says, necessary propositions concerning space, which show that the nature of space is not a "mere fact". We are intended to infer that space is an *a priori* intuition, and a psychological reason is given why we cannot imagine holes in space. The impossibility of holes is apparently what is called a necessity of thought. This argument again involves much purely logical discussion. Concerning necessities of thought, the Kantian theory seems to lead to the curious result that whatever we cannot help believing must be false. What we cannot help believing, in this case, is something as to

the nature of space, not as to the nature of our minds. The explanation offered is, that there is no space outside our minds; whence it is to be inferred that our unavoidable beliefs about space are all mistaken. Moreover we only push one stage farther back the region of "mere fact," for the constitution of our minds remains still a mere fact.

The theory of necessity urged by Kant, and adopted here by Lotze, appears radically vicious. Everything is in a sense a mere fact. A proposition is said to be proved when it is deduced from premisses; but the premisses, ultimately, and the rule of inference, have to be simply assumed. Thus any ultimate premiss is, in a certain sense, a mere fact. On the other hand, there seems to be no true proposition of which there is any sense in saying that it might have been false. One might as well say that redness might have been a taste and not a colour. What is true, is true; what is false, is false; and concerning fundamentals, there is nothing more to be said. The only logical meaning of necessity seems to be derived from implication. A proposition is more or less necessary according as the class of proposition implying it is greater or smaller.[1] In this sense the propositions of logic have the greatest necessity, and those of geometry have a high degree of necessity. But this sense of necessity yields no valid argument from our inability to imagine holes in space to the conclusion that there cannot really be any space at all except in our imaginations.

(6) The last argument may be shortly disposed of. If points be independent entities, Lotze argues—so I interpret him—that we can imagine a new point coming into existence. This point, then, must have the appropriate relations to other points. Either it creates the other points with the relations, or it merely creates the relations to already existing points. Now it must be allowed that, if there be real points, it is not self-contradictory to suppose some of them non-existent. But strictly speaking, no single proposition whatever is self-contradictory. The nearest approach would be "No proposition is true," since this implies its own truth. But even here, it is not strictly self-contradictory to deny the implication. Everywhere we come upon propositions accepted because they are self-evident, and for no other reason: the law of contradiction itself is such a proposition. The mutual implication of all the points of space seems to be another; the denial of some only among points is rejected

[1] *Cf.* G. E. Moore, "Necessity," MIND, N. S., No. 35.

for the same reason as the assertion that such and such a proposition is both true and false, namely, because both are obviously untrue. But if, *per impossibile*, a point previously missing were to come into existence, it would not create new points, but would have the appropriate relations to already existing points. The point, in fact, would have already had being, and as an entity would have eternally had to other points the same relations as it has when it comes into existence. Thus Lotze's argument on this, as on other points, depends upon a faulty logic, and is easily met by more correct views as to the nature of judgment.

I have not criticised in detail the current arguments against absolute time, as they are all included under those against space. In favour of absolute space, in addition to the paradoxes of the relational theory, I have to urge the very much greater simplicity of the absolute theory. This appears most plainly in the case of motion. On the relational theory, it is essential to a motion to specify all the changes of distance and angle with respect to all other particles in the universe, since all combinations are possible, and no reason exists for preferring one distance to another. But on the absolute theory, we have merely one change of relation: the particle, which was *at* one point, is now *at* another. The geometrical relations hold primarily between points, and only by correlation between particles. Thus geometrical propositions become timeless, and motion is infinitely simplified. I cannot persuade myself that there is anything to set against this except an antiquated logic, not re-examined in its fundamentals, and capable, if I am not mistaken, of an easy and simple refutation.

II.—THE NATURE OF SELF-KNOWLEDGE.

By S. H. Mellone.

"It is evident," observes Mr. F. H. Bradley, "that both practical and theoretical knowledge of the human mind is possessed by those who are not metaphysicians." It is also possessed by those who are not psychologists, inasmuch as they know nothing of psychology as a science. The General Nature of Self-knowledge is the problem of this paper.

§ 1. This inquiry is not the same as an attempt to explain knowledge by something else. The self-contradictory character of such a task would be generally recognised at present. But self-knowledge is a relation involved in the essential nature of Intelligence, and hence its place in the organic structure of Intelligence can be analysed without self-contradiction. To insist merely that such a relation is "unique" and "unanalysable" would be futile. A sound maxim has been laid down by one of our modern writers: Whenever we find a "mystery" we are making an assumption; and it is our duty to probe the assumption to the bottom, before we fall down to worship the mystery.

No philosophical issue is of more fundamental importance than the problem of self-knowledge. It pertains to the root of every discussion as to the means by which the psychologist *arrives at the facts* which he is to explain. And again, it underlies such discussions as arise out of Mr. Bradley's and Prof. Münsterberg's recent contributions to the problem of the relation between truth in psychology and truth in reality.[1] Yet, fundamental as these issues are, to discuss the question of self-knowledge as though it had no existence outside their limits would be a serious mistake; and there is reason to fear that its importance is frequently missed because its different forms have not been brought together. Thus we find self-consciousness treated as a process of the "natural

[1] F. H. Bradley, "Defence of Phenomenalism in Psychology," Mind, No. 33; H. Münsterberg, "Psychology and Life" (*cf.* R. B. Haldane in Mind, No. 34).

history of the individual mind," which is nothing more than a problem *for* psychology; while among the inevitable *prolegomena* to psychology, there is a perpetual lawsuit as to the method and limits of psychological knowledge, which is only another form of self-consciousness. Again, the Kantian "transcendental logic" is said to be a "complete analysis of self-consciousness, and the systematic evolution of all that is contained in the very notion of self-consciousness," while finally in some forms of philosophical theory we find self-consciousness treated as "consciousness of the Unity of the Universe". And none of these meanings of the term will cover the widely diffused knowledge of mind which has originated independently of psychology and philosophy as special studies.

The term "self-knowledge" is used in the present paper so as to include all that professes to be knowledge of some form of our inner life and has been founded on direct analysis thereof,—however concrete or abstract may be the terms in which it is expressed,—whether it is some one's statement of a personal characteristic of his own, or an intelligent "knowledge of human nature," or a psychological, logical, or philosophical generalisation. Self-knowledge is a fundamental function of our intelligence; and one and the same principle runs through and determines all its forms and degrees.

It will be useful to distinguish first a theory of self-knowledge which perhaps has not often been consciously held, but which is implied in many views and theories of the subject which have been widely supported.

The traditional account of knowledge recognises that it is always a relation or reference, involving a duality or distinction between the respective loci of the knowing and the known. That this is sound in principle is not to be denied; but a favourite way of describing the distinction is calculated to lead only to confusion. Knowledge, it is said, necessarily involves a duality of terms in the form of Subject knowing and Object known. Then in the case of self-knowledge there creeps in the assumption that knowledge is analogous to a light proceeding from the Subject and shed on the Object; the Subject is like an eye that is itself the source of the light by which it sees, and the knowing is like the seeing. This I will call the "eye-theory" of self-knowledge; and it may be worked out in different ways.

(*a*) It combines readily with another favourite doctrine: that we must make a sharp distinction between the "pure" and the "empirical" self; or, in other words, between the

mental *phenomena*, the changing temporal states, and the mental *noumenon*, the permanent substance or substratum "underlying" them. In the case of self-knowledge, the *noumenon* is the Subject which knows, the *phenomena* are the psychological objects known. Then the question arises, how can the Subject, as such, know itself? The reader will remember that Mr. H. Spencer, among many others, has vigorously contended for the *existence* of such a Subject as a necessary assumption. Combine with this the assumption that "the fundamental condition of all knowledge is the antithesis of Subject and Object," and we have the natural conclusion that the Subject, though it may know its phenomena to any extent, can never know itself: "The mental act in which self is known implies, like every other mental act, a perceiving Subject and an Object perceived. If then the Object perceived is Self, what is the Subject that perceives? Or if it be the true self which thinks, what other self can be thought of? Clearly the true cognisance of self implies a state in which the knowing and the known are one, in which Subject and Object are identified; and this is the annihilation of both. So that the personality of which each is conscious, and of which the existence is to each a fact beyond all others most certain, is yet a thing which cannot be known at all: knowledge of it is forbidden by the very nature of thought."

Two ways of avoiding this difficulty have been occasionally suggested. One is, to assume that Subject and Object are really identical in self-knowledge. This I suppose is the ordinary expression of the intuitional view, that the soul simply knows itself to exist. But what meaning can "the *identity* of subject and object" have in this connexion? Apparently its only meaning can be to obliterate the relation or reference which is essential in all knowledge. So far, Spencer's rejection of it is justified. The other resource is to affirm that the Subject is known by inference. If so, it must be a postulate to account for changes in the field of psychological objects. But if our knowledge of it is only inferential or mediate, we could never know *what* to assume in order to account for these subjectively-initiated changes. How could we even conceive or think about self or any of its activities without some basis of immediate experience to account for the conception? Mr. Spencer saw this, and expressed it in a well-known passage which I will quote because it sets forth a fundamental truth with regard to the element of immediacy in all conscious experience: "In each mental act there is an element which persists. But the

persistence of this element under successive conditions necessitates the sense of it as distinguished from the conditions and independent of them. That which is common to all states of consciousness and cannot be got rid of, is what we predicate by the term existence. . . . There remains an indefinite consciousness of something common under all modes —of being apart from its appearances. . . . Our consciousness of the unconditioned being literally the unconditioned consciousness or raw material of thought, to which we in thinking give definite forms, it follows that an ever-present sense of real existence is the very basis of our intelligence. As we can in successive mental acts get rid of all particular conditions and replace them by others, but cannot get rid of that undifferentiated substance of consciousness which is *conditioned anew* in every thought, there ever remains a sense of that which exists persistently and independently of conditions, . . . an indefinite consciousness of an absolute reality transcending relations."[1] We have here a recognition of the same truth which has been elaborated in Mr. Bradley's doctrine of Feeling, and Mr. Stout's distinction of "noetic" and "anoetic" consciousness. At present we note its particular implication, that we could never *infer* the existence of the Ego or any function of the Ego, such as Freedom, Volition, or pure Feeling, if that which we infer were not already present in consciousness but undiscriminated,—present by way of *experience*, immediate but not yet defined.

Both these attempts to remove the difficulty referred to by Spencer are, therefore, ineffective; but the difficulty is a fictitious one, for, as we shall see, the distinction of Subject and Object affords an altogether inadequate statement of the problem of self-knowledge. The perplexities that ensue are of our own making, and ought to be taken as a *reductio ad absurdum* of the "eye-theory".

(*b*) The theory may of course be held apart from any agnostic bias. It assumes that introspection is essentially a certain direction of the attention, and may be compared to a direct inspection of the contents of consciousness. The latter are, therefore, the objects of psychological knowledge.[2] This is the traditional view in Psychology. But it is so unnecessary and so indefensible that it can scarcely be allowed even the relative validity of a working assumption.

[1] With the doctrine that thought by "conditioning" an object renders it "unknowable," we have of course nothing to do.

[2] When we assume that all of what introspection reveals must belong to these contents, as elements in them or aspects of them, then we have what has been called the bias of "Presentationism".

Its main defects may be expressed in various ways. It assumes psychological knowledge to be absolutely different in kind from all other knowledge. Without parallel in the world of knowledge is this process by which the contents of mind unroll themselves before the "inner eye," as soon as this mysterious organ turns its attention to them. More pregnantly expressed, our charge is that the theory separates the knowing from the known so that the connexion becomes a merely external one; the knowing becomes a formal process with no essential relation to what is known. And as it is the merely individual and merely finite sides of the mind, with the elements composing it, which are thus "observed," this theory prepares the way for mechanical and atomistic theories in Psychology, logic, and ethics. Everything which, on this merely external view which is miscalled self-observation, appears to exist independently, is forthwith treated as a positive self-contained existence. The initial principle is the same whether the outcome be sensationalism or intuitionalism,—whether the isolated elements disclosed by "turning the mental eye inwards" are the particular "sensations" out of which the mind is supposed to be built up, or the particular "immediate perceptions" which are supposed to lie at the basis of logic and ethics.

(*c*) But the most fatal defect in this "eye-theory" remains to be noticed. On inspecting the contents of the mind we are supposed to see what is there and how it is arranged. The implication is that the *ultimate truth* can be attained by sufficiently careful observation, and that any act of self-knowledge has the highest kind of certainty and is valid in its own right. And since, again, the self whose processes are thus known with perfect accuracy is the individual self *as finite*, it is difficult to exaggerate the importance of the results to which this error leads. For it has a "counter-implication"; what we clearly and distinctly observe within us, is simply true, without qualification, and what we do not or cannot thus observe, is simply not true. It may be objected that this is the view of Common Sense: and it is so, in part. But Common Sense is before all things practical; it holds that a man may know his own mental life sufficiently for practical purposes, and it adds the important qualification that "self-deception" is extremely easy. This means simply that a man's ideas of his own inner life (particularly his desires, character and plans) may be partly illusory. From another point of view it may be objected that no one ever denied so obvious a fact. But principles which are not

denied in theory may be ignored in practical psychological investigation and discussion. For example, a theory may be quite defensible if understood as a reasonable, yet provisional, interpretation of certain complex psychological facts; reasonable, because it is the best interpretation that we can arrive at, yet provisional, because it is evidently incomplete compared with the facts as a whole, and lacks internal coherence. But we find that in many cases such a theory is attacked and defended as though it claimed to be the ultimate truth. The whole controversy regarding Liberty and Necessity has, I believe, been of this kind.[1] Incidentally, also, the foregoing considerations show why the old-fashioned "appeal to consciousness" in this and other similar vexed questions is so futile. To say "let consciousness decide" is idle, when in each case the whole complexity of the problem lies in the *interpretation* of consciousness.

§ 2. Let us now bring together the positive implications of the preceding critical remarks.

Both in psychology and metaphysics we must reject the notion of a "pure" or "transcendental" self. And the notion of an "empirical" self must go along with it, for the one is only conceived in antithesis to the other. The real self is that which is known and realised or lived in and through the actual process of conscious life. It is essentially manifested in this its content; its individual existence consists in gradually organising itself in certain explicit, definite forms. Hence if we use such terms as *Noumenon* and *Phenomena*, Reality and Appearances, we must say that the former is known *through* the latter and can be known in no other way. Similarly, with regard to the relation of Subject and Object; to say that for knowledge there must always be a Subject of knowledge, means that thought or knowledge exists only as the thought of a thinker, —it is always an activity, "an activo-passive experience of an individual subject"; and to say that for knowledge there must be an object of knowledge, means that knowledge is always a reference beyond its actual place of appearance as the conscious function of a finite personality. Is it not of the essence of knowledge to be representative or symbolic of something whose existence transcends it,—something which is in a sense "other" or "more" than the knowledge itself? And what is referred to or known cannot be identi-

[1] That is to say: all that we can ask for is this—what is the least inappropriate and incoherent interpretation of the *fact* of Freedom? Upon the fact, as such, all but materialists are agreed.

fied with the process of reference, the knowledge itself. But all knowledge is *direct* in this sense—that it refers directly to the reality known, the object referred to; and not indirectly through some substitute intervening between this and the knower. When a man reflects on his own states, and when he reflects on something in the objective world—*e.g.*, the motives of another man's conduct, or the nature of a chemical combination—his attitude to the "object" is the same; the reference is equally direct, though the knowledge is necessarily imperfect, and may in some of its details be illusory.

On this general question of the validity of self-knowledge, we may say with Prof. Adamson: "Nothing is gained, as regards accuracy of observation, by the 'intra-subjective' character of both the observed and the observation. . . . If to know the processes of consciousness means to be able to determine accurately their characteristics and differences, I should be inclined to say that we can hardly claim such knowledge. What we do possess is painfully and laboriously attained, and wants every mark of 'immediate certainty' or 'absolutely self-evidencing' character. . . . I can be, in and through the process of knowing, no more certain of what is *in my* consciousness—if we allow for the moment that any definite meaning can be put into so metaphorical an expression—than of what is beyond my consciousness. That knowing is a process of mind, and that the known is in the one case likewise a fact of mind, lends no additional certainty to the resulting cognition."[1] And as in all knowledge, so in observation of the inner life; "the thoughts whereby we determine the nature of the observed are neither in fact nor in meaning identical with the observed".[2] This is evident because in observing some fact of our inner life we do not *isolate it;* the reflexion consists in relating it in manifold ways, according to the interest of the moment; the most fundamental being its relation to the idea of self—it is at least a mode of *my* mental life. And to identify all these relations with the thought of them as I observe the fact in question, would be absurd. Self-knowledge, therefore, also involves a reference. But though this reference is direct, it is indefinite and incomplete.

This is the primary implication of the view which is here defended. No conception which we can form of the constitution of the mind or of any factor therein can be an

[1] MIND, vol. xii., p. 126.
[2] On this point *cf.* also Stout, *Analytic Psychology*, i., 44.

adequate representation of the reality; we cannot adequately state in intellectual terms the nature of our inner experiences. This does not mean merely that we do not know all that we are; it is true of every piece of self-conscious reflexion in common life, and of psychological analysis both general and detailed. All the results so obtained are relative to the present state of our knowledge; they are necessarily held subject to a revision which may have to be so thorough as completely to transform them, and each in itself has many missing links of connexion, and exhibits a general want of satisfactory coherence. But such conceptions are not therefore false; we must accept them if they are the best account which we can now form of the realities to which they refer. The more complete truth does not destroy the less complete, but expands and transforms it. Truth is like a picture of boundless extent and infinite detail, which is obliterated for us and needs to be renewed, and of which we have only recovered different disconnected portions, and these only in vaguest outline. These portions can only be correctly estimated when they are treated as such; they are fragments *of the whole* and not illusions; but they are *fragments* of the whole, and not self-contained pieces of truth, each of which can stand on its own merits. These conclusions as to self-knowledge seem to follow necessarily from the very conception of truth as an organic whole; but they need to be applied to the detailed theories of psychology.

One of the chief causes of the difficulty in arriving at satisfactory inductions in psychology is, of course, that the facts are immediately accessible to one observer only; and in order to serve more than a private purpose, in order to have any scientific value, it is indispensable to raise the result of self-knowledge from an individual to a general fact. But the difficulty must not be put in the wrong place. As we are no longer ruled by Mill's *Logic*, I suppose it will not be denied that in Induction a single case, *examined with sufficient care*, can establish a universal law. The ideal of this principle of induction is seen in Geometrical reasoning. For example, to prove that "the three interior angles of any triangle are together equal to two right angles," I must have a "figure" before me, actually or in imagination: that is, I must have recourse to the perception of a particular case. This case may be that of an isosceles right-angled triangle with sides and angles of fixed magnitude. But when the conclusion is established by consideration of this case alone, I may be sure that it holds of every other triangle, because in the proof I have considered only the essentials

of the case, and have not referred to the above-mentioned particulars, nor to anything but what is stated in the definition of a triangle. In Geometry we may be certain that our investigation is sufficiently thorough—in other words, that it is based only on the essentials of the particular case with which we work—because we frame our own definition of what these essentials are. But in physical or psychological investigations, we have to *discover* the essentials; hence the inductive conclusion suggested by any one instance has to be carefully verified, or tested, and perhaps corrected, by many other instances. Still, it is only the difficulties or defects of our own investigation which prevent any one case from establishing a reliable universal; while it is a constant occurrence that one case may *suggest* the universal. Hence, although "every mental state is by hypothesis observable, introspectively, by one observer only,"[1] it may perfectly well suggest a universal law of mind. That introspection, by itself, will do more than suggest a possible law, is very unlikely, for as we have seen it is beset with innumerable possibilities of error. Hence the scientific psychologist has to verify the results of his introspective observations by "appeals to language, to pathology, to childhood, to mankind in general". These objective expressions of mental life, to which he refers, would have no meaning for him, were it not for his previous introspective inductions, which give him the only key of interpretation. He is interested in such social facts as manifestations of mental states like to those upon which he has been reflecting; as such alone, not as "psycho-physical complexes,"[2] he appeals to them. He is no more concerned with the fact that they are mediated to his reflexion by means of physiological processes, than the student of a book is concerned with the operations of writing, printing, etc., which have made him aware of the author's thought.[3] On the other hand, as we observed, the fact that the comparison and verification of the results of self-knowledge are thus indirect, adds to the difficulty of arriving at satisfactory inductions.

What, it may be asked, is the practical consequence of this conclusion? Is it simply to throw doubt upon all varieties of self-knowledge, by viewing them as infected with error to some undefined extent? This would indeed be futile. For practical life, its consequences are numerous and

[1] See Prof. Royce's observations in MIND, No. 23, pp. 388-90.

[2] On the other side see Royce, *ibid.*, p. 391.

[3] Certain special exceptions which might be mentioned do not disprove this rule.

important; because the number of beliefs which are held, or denied, on the ground of appeals to "inner experiences" and "feelings," is not small. For psychology and philosophy, its chief consequence is this. Conclusions which will work if taken as containing truth in solution, as it were—or, as we may otherwise express it, which are symbolically true—become unworkable and even self-contradictory if taken as absolutely true. Criticism of any theory may be perfectly valid in the latter view of its truth, and yet be worthless in the former view of it, because an entirely wrong standard is employed. In psychology the standard of perfect coherence and clearness is an impossible one, and all criticism which implies it is a mere irrelevancy. If we insist upon attaining it, we do so at the cost of overlooking the complexity of mental life, and perhaps of doing violence to some of its essential features.

§ 3. That self-consciousness is a mode of knowledge which, like all knowledge, must have *degrees of truth*—is a brief and familiar way of stating the conclusion at which we have arrived. But its significance cannot be properly estimated apart from a closely related conception, with which indeed the former stands or falls. I mean the fundamental distinction and correlation (in all intelligible experience) of Thought with the element of Immediacy, which Mr. Bradley has called Feeling (after Hegel's *Gefühl*), and which Mr. Stout has called "anoetic consciousness". We must note carefully the implications of this conception in order to connect it with the question of self-knowledge. (*a*) The whole process of growth in our knowledge of the world points back to a sensuous ἄπειρον, which is the basis of external perception; knowledge begins with the definite articulation of this into intelligible fact. Sentience, so understood, is not a chaos of *data* received from a foreign agency; and it is not an absolutely homogeneous state of feeling; it contains *variations* which succeed one another in a regular order—"felt differences" which are not a chaos. Hence, as thought develops, it becomes possible for intellectual distinctions to supervene upon these felt differences; and not until this begins can knowledge and intelligent experience begin. (*b*) If we try to conceive a *purely* anoetic consciousness, as such, we can only think of it as a limit which may be gradually approached. In this limit there would still be "diverse aspects," though "not yet broken up into terms and relations"; some of these would be "features of what later becomes the environment," and would be indivisibly one with "the features of what later

becomes the self". (*c*) Self-knowledge involves the same element of immediate experience, which, as such, is not the knowledge in question, but on the basis of which alone is the knowledge possible. This distinction of anoetic and noetic consciousness has great significance at every stage of mental growth, though doubtless it is first suggested by the contrast of the earliest with the later stages. It means that not only in the beginning, but at every stage, there are whole regions of mental life which, though they may be truly said to be present *in* consciousness, are not present *to* consciousness in the sense of being *known*, *i.e.*, intellectually discriminated and interpreted; but they may largely determine the character and contents of those regions of mental life which are known. Our self-knowledge grows in depth and truth whenever something more of what is present in consciousness becomes not only present in, but present to, consciousness. This, then, is the fundamental principle running through all forms of self-knowledge. We express it in very simple language. Before any fact can be known to any extent, or *thought* about, in the proper sense of the word, it must be felt; in the one case the feeling is there, but is not thought about, or only vaguely thought about; in the other case, the feeling is still there, but thought has begun to grasp and construct its meaning.[1] Our capacity for higher insight and knowledge grows as we pass from the former state into the latter.

Thus self-consciousness may be the most superficial or the most fundamental mode of knowledge, according to the degree of truth which we understand it to have attained. It is the result of the self-transcending tendency of thought through which thought always refers beyond itself. If we have regard only to that degree of truth which is necessary for the practical and theoretical purposes of everyday life and of physical science, we may say that this "reference beyond" is in two directions. By the "outer" direction of its intelligence the conscious self conceives (or is capable of conceiving) of the world as a whole with its dependent parts; by the "inner" direction of its intelligence it conceives of itself as an individual centre, having the unity of a personal life which is more than knowledge. Common Sense adopts a point of view

[1] From this principle it follows naturally that in the case of psychological analysis, we do not and can not analyse what is discriminated, or what is *present to* consciousness; but our thought reconstructs what *was present but undistinguished in* consciousness or in the results of previous analysis or discrimination. *Cf.* Stout, *Analytic Psychology*, vol. i., pp. 52-61.

from which this distinction of the "inner" and "outer" directions is regarded as practically ultimate. But analysis need not go far to show that it is a metaphor with only a limited applicability. Self-consciousness *includes* an awareness of the processes in us by which our consciousness of a world is realised and extended; or rather, it is capable in its higher degrees of including this awareness, but always includes fragments of it. When thus developed self-consciousness brings to light the fundamental presuppositions and ultimate ideals of physical knowledge (*e.g.*, the world as a systematic unity—within which general laws obtain). Similarly, by reflexion on the ethical and æsthetic consciousness (and its actual achievements), ideals of Goodness and of Beauty are brought to light. Whether we regard self-consciousness, when fundamentally developed, as finite or not, depends on considerations arising out of a general metaphysical position; but if we conclude that the human self has a finite and infinite side, then self-conscious is merely finite only in so far as we have not learnt to know the real constitution of our nature. The principle is throughout the same; there is always the general background of sentience, out of which arises thought itself and the experience which thought makes intelligible, and in this intellectual formulation of what was previously undistinguished, the process of knowledge consists.

§ 4. These conclusions may now be applied to certain questions affecting the position of Psychology as a science. I will take these questions in the form in which they are set forth in Mr. Bradley's suggestive and thorough-going "Defence of Phenomenalism in Psychology". I do not write as a mere critic of what is said in that paper, for I have been glad to find that, in what seem to be the most essential points, the views which I have been trying to defend are in harmony with those of Mr. Bradley. And it is clear that by "Phenomenalism" Mr. Bradley means something very different from what Prof. Seth, Prof. Ward and others have attacked as "Presentationism". The essence of this theory or method, as I conceive it, is to reduce all the contents of mind to complications of atomic sensations; the only function of the mind being sensation characterised by quality, intensity, and tone of feeling. No one thinks of denying that the subject may be thus treated when approached from the point of view of Physiology and of Psycho-physical Experiment; but such a procedure gives only a useful fragment of Psychology, and not the whole of it. What we protest against is the assumption that the

only "scientific" and non-metaphysical treatment must be of this kind. And I cannot see how this assumption can be dismissed as a "gross error," as "exploded in principle," as "a thing with which one need hardly trouble oneself,"[1] when it is openly made and defended by some of the foremost psychologists of the day. Hence it seems to need and to deserve more careful examination than Mr. Bradley is willing to give it.[2]

The points raised by Mr. Bradley, on which I should like to remark, are these: the correlation of the known with the experienced; the principle by which Psychology is to be separated from Metaphysics; and the validity of the "General Analysis of Mind".[3]

(*a*) Remembering that experience includes anoetic consciousness, which is present in every stage of mental life, and present most of all in our consciousness of Ideals, we must give an unqualified adhesion to the fundamental view that if anything is eliminated from the *experienced* world it is in fact banished from the world altogether: for there is no other world in which it could exist.[4] Hence not only Pleasure-pain, Will, and Self, but also Reason, our highest rational Ideals, and the Absolute itself must be experienced if they are known. Mr. Bradley refers (p. 38) to a view that Self and its activities, including Pleasure-pain, "is not itself perceived, and does not itself enter into the experienced content, and is not and cannot itself be made into an object". If this means, strictly and literally, that it cannot be experienced, then such a view is "a thing with which one need hardly trouble oneself". But the statement that the Self "cannot be made into a psychological object," contains a subtle ambiguity, which requires mention, as such statements are frequently met with.[5] Psychology is not bound, and as a particular science is not able, to discuss the ultimate nature of the Self, the Will, etc.; but if it is to

[1] MIND, No. 33, p. 37.

[2] *Cf. Studies in Philosophical Criticism and Construction*, ch. iv., pp. 209-224. As Mr. Bradley has referred to this book, I will say here that in ch. v., which deals with the question of Self-knowledge, the problem now seems to me to have been imperfectly stated and wrongly approached.

[3] *Philosophical Criticism*, pp. 46, 58, 109.

[4] MIND, No. 33, p. 41.

[5] *Cf.* for example some of the views referred to by Mr. Haldane: "An absolutely final Subject . . . never itself capable of presentation as an object within experience"; "an activity that lies beyond experience and is determinable only as that which makes experience possible"; "the will as such . . . can never itself be an object in experience,—is not cognisable by psychological methods" (MIND, No. 34, pp. 206, 208, 210).

exist at all it must know something about them. And so far as Psychology knows anything about such factors of mental life, those aspects which it knows are "objects before the mind". If again we are able in metaphysics to revise and extend the partial, limited knowledge of Psychology, all that we do is to determine the object more truly. To be made an object in experience means to be discriminated and known; hence, with Mr. Bradley, we reject as unmeaning the doctrine that anything is *never* itself capable of presentation as an object within experience. On the other hand, that which is known is never identical with the knowing; hence, in this secondary sense, we have to affirm the doctrine that nothing is ever itself capable of being presented within experience as an object identical with the knowledge of it. And closely connected with this use of the term in question, is the view to which we shall have to refer immediately (*c*),—that Pleasure-pain and Conation are not merely elements or aspects of Presentation. This is what is usually meant by saying that they cannot be made into "objects".

(*b*) I regret to have to refer to the unprofitable and over-discussed question of the relation of Psychology to Metaphysics. Happily, Mr. Bradley has stated it in a fresh and pregnant form. He looks for a "clear principle" of division between the two, and finds it in this—that Psychology is confined to *phenomena* and the *laws* of phenomena; and, "since Psychology is not concerned with more than this, it is at liberty to use fictions, and the question of truth is not to be raised in it except so far as truth means whatever serves best to explain the course" of mere phenomena: the *course* of phenomena being strictly limited to their co-existence and sequence. But, whether the fault lie in myself or not, I am unable to see how this provides the *clear principle* which is desired. For in this view of the limits of Psychology, the conception of *phenomenon* is of fundamental importance; and, from the nature of the case, it must be a fluid conception,—apart from the restriction that "it is not for the purpose in hand taken as anything more than an adjective happening to and qualifying a particular soul" (p. 28), which, as Mr. Bradley says, is not by itself sufficient to exclude metaphysical questions (p. 27). What is a phenomenon? It is immediately experienced (p. 28); and "what is experienced is a whole with certain aspects which can be distinguished, but as so distinguished are abstractions" (p. 36); but "phenomena are not all perceptions, they are not all objects given to a self, they do not all come before the mind" (p. 37). In other words, they

are aspects of the experienced, which includes *feeling*. And feeling includes as much as can be discovered in it. Of course the previously undistinguished aspects of feeling become objects, but their extent must be left indefinite. For feeling is not limited to the "cœnæsthesia," which is present while life lasts; it is implied in mental analysis at every level,—as much in the analysis of thought itself by thought as in any other. In fact, "phenomena" in this sense are properly defined as fragments or partial aspects considered apart from the whole reality to which they belong: everything is therefore a phenomenon which falls short of the whole Truth and Reality, and this is most clearly true of all our psychological knowledge. But I cannot see how this fundamental truth can be so used as to give us a clear principle of division between Psychology and Metaphysics. Mr. Bradley's principle would be clear if phenomena were limited to objects, and then psychological phenomenalism would have close affinity with the metaphysical phenomenalism which he rejects. Phenomena would become, in both cases, facts which might be known to any extent without our knowing any more of the Reality of which they are phenomena. But is there the least affinity, as Mr. Bradley implies that there is (p. 26), between metaphysical phenomenalism, so understood, and the psychological phenomenalism which he defends? There are two fundamentally different conceptions of phenomena involved. In the latter case phenomena are partial aspects; and there is the closest relationship between phenomenalism in Psychology and in Metaphysics,—only that in the case of Psychology we are deliberately content to work with facts which are evidently fragments and with laws which are partly false, and in the case of Metaphysics we desire that our finite thought and will shall completely express the nature of Truth and Reality so far as it can be grasped by us *as a whole*. But as we know that the finite falls indefinitely far short of the Absolute, to that extent we are phenomenalists in Metaphysics.

Here I wish to suggest another question. Is there really much profit in discussing the division of *Psychology in general* from Metaphysics? It may be approached from the point of view of Physiology, Psycho-physical Experiment, Mental Pathology, Ethnology, Direct Analysis, and Genetic Explanation. We only need to raise the question of division from Metaphysics in the case of the last two of these branches; and the answer to it surely must depend as much on our conception of metaphysics and metaphysical method,

as it does on our conception of psychological method: but the method appropriate to Metaphysics can hardly be settled before we begin Psychology. And from the side of Psychology it seems impossible to find any principle which shall be theoretically satisfactory. In Metaphysics the explanations must be as true as we can make them,—the problems probed as deeply as possible. In Psychology, numerous questions, such as those mentioned by Mr. Bradley (p. 27), are deliberately excluded, not on any principle but by a practically necessary compromise. We see that as a matter of fact if Psychology raised such questions, it would commit suicide and be dissipated in Metaphysics,—it simply could not exist as a particular science. Experience shows which are the questions that Psychology can try to answer consistently with its own existence. For the rest it is in the interest of clear thinking not to stretch the separation of Psychology from Metaphysics, lest in the supposed non-metaphysical treatment certain metaphysical assumptions should be lurking unseen and so giving a subtle bias to "scientific" results. And it will not be denied that some problems proper to Analytic and even to Genetic Psychology may have important metaphysical and logical bearings.

(*c*) A large body of psychologists think that it is most convenient and also scientifically most useful to begin with a "general analysis of mind,"—a statement of the *typical form* of the psychologically complete mental function. Now it is a common experience that when a change takes place in our perceived environment, we are pleased or pained by the change, and we act accordingly. Hence it is affirmed that in the typical form of consciousness, we find a Subject (1) perceiving objects, (2) feeling the pleasure or pain which they excite, and (3) striving to them or away from them accordingly. The three-fold function thus consists in Intellection, Pleasure-pain, and Activity or Conation. It is also affirmed that Pleasure-pain and Conation are not simply elements *in* the presentation, so as to be constituent parts of it; they are not mere aspects of the presentation (as are quality and intensity); they are distinct enough from it to be thought as absent without the presentation disappearing with them. Mr. Bradley has criticised this view on the assumption that it regards Pleasure-pain and Conation as incapable of being experienced and as somehow known indirectly. If any one has ever held such an extravagant paradox, Mr. Bradley's crushing refutation of it is well deserved. What is maintained is that as a matter of experience consciousness means knowledge and more than

knowledge; and in this "more," we can as a matter of experience distinguish (*a*) a state of which the intensity appears in general to be conditioned by the presentations, and (*b*) one of which the intensity appears in general to condition the presentations.[1] Mr. Bradley contrasts this view with the one on which we have been dwelling above,—the implication of feeling, the anoetic element of immediacy, in all conscious life (pp. 40, 41); but to me they are so far from being inconsistent, that I could not maintain the former without the latter. When we assume that, in general, the Subject in being conscious of presentations is in a relation of activity and affection (pleasure or pain) to them, we are expressing in intellectual terms certain felt differences which pervade mental life. For this reason, and no other, I am able to estimate the significance of the expression which is adopted. Hence I cannot admit that either here or in the book to which Mr. Bradley refers, I have left a false view standing side by side with the true one, with which it is "radically discrepant" (p. 41). I maintain that there are no general grounds on which the relative validity of this General Analysis can be denied,[2] and that through a large part of the subject it will work. On the other hand, its limitations were fully recognised. It is only applicable where presentations have at least begun to be discriminated into distinct objects. We can prove to demonstration that it breaks down if applied to the beginning of consciousness in the order of time on the earth,[3] and to the ultimate Ideal of consciousness;[4] and as a matter of present fact, it will not work with those pleasures and pains whose exciting objects come nearest to being modes of anoetic consciousness.[5]

It is certain *a priori* that such limitations will pertain to any psychological theory, whether general or not. But this is no reason for its rejection, unless we have another theory to propose which is in itself logically more satisfactory,

[1] The term Subject is used to emphasise the individualised or centralised character of every consciousness, with its unity at every moment and its continuity through successive moments. To this Mr. Bradley finds no objection (p. 30). The Presentations are modes of noetic consciousness,—perceptions, mental images, ideas, memories, opinions, knowledges, and so forth. The Conation is normally guided by the pleasure or pain which these arouse, and they are its object. I find myself that I certainly do not attend to the pleasure-pain but to its object; and this is especially marked if in order to maintain a pleasure in consciousness, I seek to maintain its object and there is difficulty in doing so.

[2] The general grounds on which it may be defended were fully set forth in *Philosophical Criticism*, ch. iv.

[3] *Ibid.*, ch. v., p. 275 ff.

[4] *Ibid.*, ch. vii., p. 374 ff.

[5] *Ibid.*, pp. 202, 203, 239 ff.

which has more explaining power over such *cruces* of psychology as are the problems of Emotion, Belief, Desire, Attention, Association, and above all, which goes further towards enabling us to regard all forms of mental life as modes of one fundamental function or type.

I will add a note in conclusion on a point connected with our general subject. If there is an ultimate relation in experience, we cannot say that it is the relation of Presentation, which implies the stage of noetic consciousness. A fact is not presented to me until I have begun to think about it. But in beginning to think about it, I am entering the region of uncertainty and indefiniteness as well as of knowledge,—for it is the nature of knowledge to be a process of gradual differentiation in which one "fact" always implies others and no fact is self-contained. We cannot get back to any presentation which is free of this process of thought, or which is ultimate in the sense of being a solid rock on which we can stand and start. We must rather say that the fundamental relation in experience is "fact thought about". In speaking of "fact," we draw attention to the place of sentience in the growth of knowledge; while the thought about it implies on the one hand the background of sentience to be reconstructed, and on the other an Infinite Organism whose functions are the laws and ideals of the thinking.

III.—THE RELATION OF THE TWO PERIODS OF FICHTE'S PHILOSOPHY.

By Ellen Bliss Talbot.

The question of the relation between the earlier and the later form of Fichte's philosophy is one which has often been discussed and upon which widely different opinions have been held. Some maintain that in the later works we find a complete abandonment of the fundamental doctrines of the earlier, while others declare that there is no essential difference between the two periods. Where there is so great disagreement in a matter of interpretation, the natural inference is that the truth lies somewhere between the two extreme views. And with regard to the relation between the two phases of Fichte's philosophy, this seems to be the case. That there is a noticeable difference between the prevailing doctrines of the two periods seems clear; but that the difference is not so far-reaching as many have supposed, is equally evident.

In this brief study it will not be possible to consider all the differences—real or apparent—between the two periods. We shall have to confine ourselves to the most important phase of the question, namely, the relation between the conception of the ultimate principle which appears in the earlier works and that which is found in the later. In the first period Fichte speaks of his ultimate principle as the 'Ego,' the 'Idea of the Ego,' and occasionally as 'God'. In the second period he designates it as 'being,' 'God' or the 'Absolute'; and at the same time he uses the term 'knowing' or 'absolute knowing' in such a way that it seems to be simply another expression for the Ego of the first period. This suggests that the Ego, which seems in the earlier works to be regarded as ultimate, is represented in the later ones as depending upon a still higher principle; and if this be the case, then it seems that there must be a considerable difference between the two periods.

The close relation between the Ego of the first period and Kant's transcendental unity of apperception has often been

pointed out. Kant had shown that there is implicit in the consciousness of each individual a principle which is not itself individual, which is valid, not merely for this particular self-consciousness under these particular limitations of time and space, but for all self-consciousness which is like our own. On Kant's view, however, this transcendental apperception is set over against a world of independent reality. The thing-in-itself and the Ego-in-itself are two distinct principles; and their unity—if indeed they are ultimately a unity—is possible only through their common relation to something which is higher than either of them. But we can never know anything about this supreme unity,[1] the effort to do so would be simply an attempt to establish a system of metaphysics; and metaphysics, as the *Kritik der reinen Vernunft* teaches us, is impossible.

It is at this point that Fichte takes up the problem. He is by no means convinced of the impossibility of metaphysics. In fact it is one of his fundamental presuppositions that philosophy is possible. Now this means, in the first place, that underneath the seeming duality of our experience there is a unitary principle. But it means still more; for it is conceivable that there should be such an ultimate unity and yet that philosophy should be utterly impossible for us. If philosophy is to be a possibility, then it must be true, not only that there is a unitary principle, but also that we may have some sort of knowledge of it. It cannot be utterly inaccessible to human thinking; our own consciousness must give us the key to its nature.

Now when Fichte comes to analyse this consciousness, he finds, as Kant found before him, that it contains two principles—a formal and a material, a subjective and an objective. He finds too that these principles seem opposed, that the subject sets itself over against the object, regards the object as something foreign to it. This seeming opposition in consciousness it is the philosopher's task to overcome; how does Fichte propose to overcome it?

In the *Erste Einleitung* he tells us that all philosophical systems are reducible to two, which he designates respectively as dogmatism and idealism. Dogmatism takes as its principle of explanation the thing-in-itself—mere lifeless being—and seeks to deduce life and consciousness from it. Idealism takes as its principle intelligence or the Ego, which is an

[1] "Human cognition has two stems, sensibility and understanding, which perhaps spring from a common, but unknown root" (*Kr. d. r. V.*, A, 15).

activity. Neither of these two philosophical systems can directly refute the other. But idealism can indirectly refute the rival theory—and thus establish itself—by showing that the dogmatist fails to explain what he professes to explain. Dogmatism cannot bridge the "gulf . . . between things and thoughts (*Vorstellungen*); instead of an explanation it offers us a few empty words. . . . Dogmatism is therefore . . . not philosophy, but only a feeble affirmation and assertion. Idealism remains as the only possible philosophy."[1]

Fichte's principle of explanation then is the Ego. Now it is possible to take this 'Ego' in two different ways; namely, as pure subject (mere form) and as the unity of subject and object (of form and matter). The first interpretation is at least suggested by the discussion in the *Erste Einleitung* which we have just been considering. Consciousness itself contains two principles, a formal and a material. But its material principle is just that which leads us to postulate the existence of the thing-in-itself. Hence, when Fichte says that instead of trying to explain the Ego by the thing we should rather seek to explain the thing by the Ego, one can hardly be blamed for supposing him to mean that the subjective principle is the higher of the two and that the objective is a secondary manifestation of it. And if we interpret the *Wissenschaftslehre* in this way, it seems to be a thorough-going subjective idealism, in which all the material aspect of thought is regarded as mere *Schein*, while the former aspect alone is taken as ultimately real.

But this does not seem to be Fichte's meaning. Our key to the nature of the ultimate principle is consciousness in its *dual* aspect of subject and object. In experience we always find both form and matter, and it is impossible for us to conceive of the one as existing without the other. Each principle has its rights; to make either one the explanatory ground of the other would be to do injustice to this other. Hence the unitary principle to which consciousness gives us the clue must not be identified exclusively with either one of the two aspects, but rather with both of them. In consciousness, however, the two aspects are always in opposition to each other; subject and object are always found together, but they are found opposed. The one principle, then, which is to explain both and to do justice to both, must be that

[1] *S. W.*, i., 438. The real justification of idealism, however, as Fichte tells us a little later, can consist in nothing else than the successful accomplishment of its task; by means of the principle which it postulates, it must harmonise all the facts of experience (*op. cit.*, 445 f).

unity of subject and object which is never explicit in consciousness, but is always implied in it.[1]

Or, to put the matter in a somewhat different way, although consciousness itself is dualistic, yet the goal toward which it is striving is a unity. Thought is nothing else than the effort to unite these opposed terms; and the development of thought is simply the progressive realisation of that unity of subject and object which is its ideal. Thus, when we say

[1] No one can hope to solve "the problem of all philosophy . . . who does not find a point in which the objective and the subjective are not separated at all, but are entirely one". The *Wissenschaftslehre* "finds such a point and starts from it. Egohood, intelligence, reason . . . is this point.

"This absolute identity of subject and object in the Ego can only be inferred; we can never put our finger upon it as a fact of actual consciousness. Whenever actual consciousness arises, even if it be only the consciousness of self, the separation ensues. I am conscious of myself only in so far as I distinguish myself, the conscious subject, from myself as the object of this consciousness. *The whole mechanism of consciousness is based upon the various aspects of this separation of subjective and objective and of their subsequent union*" (*S. W.*, iv., 1).

"Knowing and being are separated, not outside consciousness and independently of it, but only in consciousness; their separation is the condition of the possibility of all consciousness. . . . The One which is thus separated is the ground of all consciousness" (*op. cit.*, 5; *cf.*, 42).

These passages are taken from the *Sittenlehre* of 1798; but in the *Grundlage* also, though the statements are not quite so explicit, we find the same doctrine. The infinite activity limits itself in order that it may become an Ego. But it can limit itself only by setting an object over against itself and thus determining itself as subject in opposition to this object. "In so far as the Ego posits itself as limited, its activity is directed, not immediately upon itself, but upon a Non-Ego, which it opposes to itself" (*S. W.*, i., 256). "The determination of the Ego consists in its *determinability by means of subject and object*" (*op. cit.*, 201). Thus, through the self-limitation of the infinite activity finite Ego and Non-Ego—*i.e.*, consciousness with its opposition of subject and object—come into being.

The fact that in the *Grundlage* Fichte uses the term 'Ego' both for his ultimate principle and for the subject of consciousness—the finite Ego to which an object or Non-Ego is opposed—has perhaps somewhat obscured his meaning. For this, taken with the statement that there are not two Egos, but only one (*S. W.*, i., 255), may suggest that the subject is more intimately related to the supreme principle than the object is. The difficulty really arises, however, from the fact that Fichte uses the term 'object' or 'Non-Ego' in two different senses. Sometimes the phrase signifies simply the objective principle in consciousness; and in this case the object is thought of as standing on the same plane with the subject. But when Fichte has in mind the prevailing notion of the thing as existing without relation to thought, then he is concerned to prove that the concept has no validity. The object, conceived of apart from consciousness, *is* mere *Schein*, a creature of the imagination, an *Unding;* consciousness and not the thing-in-itself gives us our clue to the nature of the ultimate principle.

that our own consciousness gives us the key to the nature of the ultimate principle we mean that this principle is identical, not with consciousness as it really is, but with the ideal toward which it is working.

This conception of the supreme principle as the ideal of thought is prominent in the first period of Fichte's philosophy. The universe is interpreted in terms of the final cause; it exists in order that the Idea may be realised. The ultimate principle is not *Sein*, but *Sollen*. That highest unity for which Spinoza sought "we shall find again in the *Wissenschaftslehre*—not, however, as something that *is*, but as something that *is to be* through our agency, and yet *cannot* be".[1] God is not substance. "He is the living and working moral order," which "is built up by right-doing".[2]

In this conception, the relation between human thought and its supreme principle is a close one. Consciousness is a necessary stage in the realisation of the ideal, is in fact a partial realisation. And the complete manifestation of the Idea would be the perfected consciousness, in which the opposition of subject and object is at last overcome.[3] Thus the principle which we invoke in order to explain the nature of consciousness is not transcendent, but immanent. The ultimate ground of thought is not something outside thought, it is present implicitly in every stage of consciousness.

It must be remembered, however, that according to Fichte's view, the Idea can never be fully realised; the opposition of subject and object can never be wholly overcome. The world of consciousness is the progressive realisation of the ideal; but the progress is infinite. "The goal of the rational being is, of necessity, infinitely distant; it is a goal which cannot be attained, but to which we . . . may constantly approximate."[4]

Such is the conception of the ultimate principle which appears in Fichte's earlier works; and at first thought it seems very different from that which is found in the later writings. The change in Fichte's point of view is well brought out in the *Darstellung der Wissenschaftslehre* of 1801. In this book the term 'Ego,' which appears so constantly in the *Grundlage*, is usually replaced by the word 'knowing'.

[1] *S. W.*, i., 101. [2] *Ibid.*, v., 185 f.

[3] "The goal of this striving (the Idea of God) is an Ego, which, in its self-determination, determines at the same time all the Non-Ego" (*S. W.*, i., 23). Fichte himself would probably hesitate to give the name 'consciousness' to this ultimate unity, since consciousness in his definition of it involves the opposition of subject and object.

[4] *S. W.*, iv., 149; *cf.* i., 416 note.

The relation between absolute and particular knowing seems to be the same as that which we found in the earlier works, between the individual consciousness and its ultimate principle. Particular knowing is the realisation of absolute knowing. Knowing as absolute is never actual; it has actuality only in so far as it is a "knowing of something," *i.e.*, in so far as it draws a distinction between subject and object. "All our actual and possible knowing is never an absolute, but only a relative, knowing, which is determined and limited in one way or another."[1] Thus consciousness is an inadequate realisation of that perfect unity of subject and object—or, to use the terminology of the *Darstellung*, of freedom and being—which is never completely actual.

The relation between particular and absolute knowing is thus very close; and if absolute knowing were identified with the ultimate principle, as the Ego of the *Grundlage* seems to be, we should have no ground for thinking that there has been any change in Fichte's doctrine. But apparently absolute knowing is not the ultimate principle. "It is involved in the mere concept of absolute knowing that it is not the Absolute. Every additional word which is joined to the expression, 'the Absolute,' destroys the absoluteness. . . . The Absolute is neither knowing nor being, nor is it either identity or difference of these two; it is simply the Absolute."[2]

Many passages of similar purport are found in the various works of the second period:—

"The *Wissenschaftslehre* has been interpreted as a purely idealistic system, which takes the absolute Ego for the Absolute and tries to deduce everything from it. . . . No one, friend or foe, has risen to a higher conception of the system."[3]

The origin of absolute knowing is to be sought in "something which is not knowing at all," and which "we may perhaps call 'being'".[4]

"Nothing exists outside God . . . except knowing; and this knowing is the divine existence itself. . . . God not only is (*ist*), inwardly and concealed within himself; but he also exists (*ist da*) and expresses himself."[5]

These passages and many others which might have been quoted from the works of the second period seem to indicate

[1] *S. W.*, ii., 13. [2] *Ibid.*, ii., 12f.
[3] *Die Wissenschaftslehre* (1804), *N. W.*, ii., 193.
[4] *Ibid.* (1813), *N. W.*, ii., 3.
[5] *Die Anweisung zum seligen Leben*, *S. W.*, v., 448f. *Cf. S. W.*, ii., 686, 696; iv., 431; *N. W.*, iii., 3f.

a decided change in Fichte's position. There is little ground, however, for saying, as some do,[1] that Fichte has ceased to regard his ultimate principle as activity and thinks of it rather as mere lifeless being. Loewe, it seems to me, has proved the incorrectness of this interpretation.[2] He maintains that the term 'being,' as used in the *Wissenschaftslehre*, has two meanings. When Fichte tells us in the earlier works that mere being can never serve as an ultimate principle, he has in mind being as opposed to activity—mere lifeless being, the thing-in-itself. But in the later works, where he often applies the term 'being' to his ultimate principle, he takes pains to tell us that this being is at the same time life and activity.[3]

We cannot say then that the ultimate principle of the later works is being as opposed to activity. But on the other hand, as we have already seen, Fichte does seem to think of it as a higher principle on which knowing depends. Thus our explanatory ground is regarded as transcendent; we now try to explain consciousness, not by a unity implicit within it, but by a foreign principle.

That the change in Fichte's position, however, is not so great as it appears, becomes evident when we are able to trace the line of argument by which he passes from his earlier to his later conception. In the writings of the first period, as we have seen, stress is laid upon the statement that the Ego is not and never can be fully realised; it is simply the goal of an infinite progress. Now if we say that only the world of consciousness is real, that the Idea exists simply in and through consciousness—if we say this *and nothing more*, we seem in a sense to be exalting the world of consciousness above that Idea which we have styled its supreme principle. It is hard to see how an ideal which can never be attained and *which has no truth apart from its being attained* can fulfil our conception of the ultimate principle. If the Idea of the Ego can never be completely manifested and if it is nevertheless the supreme principle, there must be a sense in which it can be said to have validity in itself, apart from its manifestation.

Something of this kind must have been the thought in

[1] *E.g.*, Windelband, *Geschichte der neueren Philosophie*, ii., 226.

[2] *Die Philosophie Fichte's nach dem Gesammtergebnisse ihrer Entwickelung*, chap. iii.

[3] In a letter to Schelling, written in 1801, Fichte says: "If we wish to give the name of 'being' to that which even our present insight cannot penetrate . . . then God is pure being. But this being, in itself, is not compression; it is, throughout, agility, transparency, light. . . . It is being, only for the finite reason, but not in itself" (*J. G. Fichte's Leben und litterarischer Briefwechsel*, second edition, ii., 345).

Fichte's mind which led to his adopting the new form of exposition that we find in the later works.[1] At any rate this argument seems to be implied in an interesting passage in the *Thatsachen des Bewusstseins* of 1810. In this work Fichte starts with the lowest stage of consciousness and gradually develops from it the doctrine of the Idea as the ground of the world's existence. "Life exists," he tells us, "not for its own sake nor *through* itself; the ground of its existence is . . . in the final purpose." Then he goes on as follows: we cannot say that the Idea "*is* as a fact (*factisch ist*) in the sphere of phenomena," but only that it "*shall* be and become in this sphere through life itself".[2] In the world of phenomena the Idea *is* not, but simply *becomes*. In itself, however, in abstraction from this world, "it does not *become*, but *is*".[3] This must be the case if the final purpose is to be our ultimate principle. We cannot think an absolute becoming in which there is no element of fixity; such mere becoming would vanish into nothingness.[4] The eternal Idea, then, is the firm basis of all becoming.

But now can we be sure that this final purpose is absolute? "The being of life, which must be presupposed as the ground of life, becomes final purpose merely in the synthesis with becoming, which is the form of life. Outside this synthesis, beyond this form, we may not speak of a final purpose, but only of being, pure and simple. The final purpose is thus the expression of being in becoming in order that being may be made visible." This being, which appears in the form of life as final purpose, is God.[5]

It seems then that Fichte's position is this. The supreme principle may be termed 'Idea' when we think of it in its relation to the world-process, *i.e.*, to its realisation. But if we think of it in itself, apart from its realisation, we should no longer speak of it as 'Idea'. In the first case we are looking at the ultimate principle in its temporal aspect;

[1] I do not mean to deny that the charges of solipsism and atheism which were brought against Fichte by his contemporaries may have had much to do with his change of terminology. The substitution of the word 'knowing' for the 'Ego' was probably due in large measure to a desire to escape the first charge. Perhaps, too, the distinction between knowing (as God's *Dasein*) and his pure *Sein* was adopted partly for the sake of stilling the cry of 'atheist'. But in so far as the change is more than one of terminology, its ground, I think, is to be found in the train of reasoning which I have suggested. Fichte was not the man to be greatly influenced by the clamour of his opponents. Besides, as we shall see shortly, traces of the later doctrine are to be found even in the works of the first period.

[2] *S. W.*, ii., 658.
[3] *Op. cit.*, 659.
[4] *Ibid.*, 681 f.
[5] *Ibid.*, 683 f.

hence we think of it as life, activity, development. In the second case we look at it in its timeless aspect; it is that which abides throughout the ceaseless flux of the world-process.

But there is no need of regarding these two conceptions as utterly antagonistic. The temporal and the timeless view of the world are not so essentially opposed as we usually think. They are rather correlative aspects of reality; each is needed to complete the other. Hence the difference between Fichte's two periods is chiefly one of emphasis. In the one case we are concerned with the temporal aspect of the supreme principle; we think of the world-ground as the ideal which finds its truth in its realisation. In the other case we emphasise the timeless aspect; we insist that this world-ground has truth in itself whether it be realised or not. In the first case we have naturally a very close relation between consciousness and the supreme principle; in the second case the relation seems less intimate.

And a further consideration which goes to show that the difference between the two periods is not so great as it seems, is this: in each period we find unmistakable traces of the characteristic doctrine of the other period. Our discussion of this point must be brief; but it will be sufficient, I think, to establish the contention.

If we look carefully at the earlier writings we find in them suggestions of that tendency of thought which is so manifest in the later works. In the following passage from the *Grundlage*, for example, we have an anticipation of the statements which we quoted from the *Thatsachen des Bewusstseins;* for the words certainly suggest that the Idea, conceived apart from its realisation, is most adequately described as 'being'. Fichte is pointing out the difference between the *Wissenschaftslehre* and Stoicism. "In consistent Stoicism," he says, "the infinite Idea of the Ego is taken for the actual Ego; absolute being (*Sein*) and actual existence (*Dasein*) are not distinguished. . . . To the Stoic sage are attributed all the predicates that belong to the pure Ego or to God. According to the Stoic ethics we are not to become like God but we ourselves are God. The *Wissenschaftslehre* carefully distinguishes absolute being and actual existence and takes the former simply as ground in order to be able to explain the latter."[1]

This is the most striking instance that I have found in the earlier works of a disposition to think of the ultimate principle apart from its realisation; but there are several

[1] *S. W.*, i., 278 note.

passages in which we see a tendency to distinguish sharply between the principle and human consciousness. The goal of the infinite process is usually conceived, not as blank identity, the mere infinite, but as identity maintaining itself through difference, the infinite which includes the finite. Sometimes, however, Fichte speaks as if the goal of the progress were the utter annihilation of the finite.[1] And the tendency to conceive the goal thus, since it implies a sharp distinction between consciousness and its ground, reminds us of the efforts of the later period to free our conception of the Absolute from all limitations.

And on the other hand in the works of the second period, though the general tendency is to insist upon the distinction between absolute knowing and the Absolute, we find many evidences of a disposition to conceive the ultimate principle less abstractly. Although Fichte is careful to distinguish between God's *Sein* and his *Dasein*, between the outer life, of which the *Wissenschaftslehre* professes to give an exposition, and the hidden inner life, which it can indicate to us but cannot describe, yet he often insists upon the unity of these two aspects of the one essence. *E.g.*, in the *Anweisung zum seligen Leben*, he says, "God himself—*i.e.*, the inner essence of the Absolute, *which is distinguished from its external existence only for our finitude*[2]—cannot destroy this absolute fusion of the essence with the form; for even his existence . . . is not accidental, but . . . *must follow necessarily from the inner essence*".[3] And in the *Darstellung* of 1801 we find these words: "Absolute knowing produces itself from its pure possibility, as that which alone is prior to it,[4] and it is just this pure possibility which is the pure being".[5]

[1] "In so far as the Ego is limited by the Non-Ego it is finite; but in itself . . . it is infinite. These two aspects, its infinity and its finitude, are to be united. But such a union is in itself impossible. For a long time the strife is smoothed over by mediation; the infinite sets bounds to the finite. But at length, since the utter impossibility of the desired union is manifest, the finitude must be altogether destroyed: all limitations must disappear; the infinite Ego must remain alone, as one and as all" (*S. W.*, i., 144).

"The utter annihilation of the individual and its absorption into the absolutely pure reason-form or God is certainly the ultimate goal of the finite reason; only it is not possible in any time" (*S. W.*, iv., 151; *cf.*, 147).

[2] The italics are mine.

[3] *S. W.*, v., 510.

[4] A slight emendation of the text seems to be required. The original has, "Dies [*sc.* das absolute Wissen] erschafft sich eben selbst aus seiner reinen Ulögiichkeit, als das einzig ihr vorausgegebene". For the last phrase it seems necessary to substitute "als dem einzig ihm vorausgegebenen".

[5] *S. W.*, ii., 63.

Even more conclusive than these passages is a discussion in the *Wissenschaftslehre* of 1804. In the greater part of this work Fichte has been insisting upon the impossibility of our knowing anything about the inner life of the Absolute. The only insight into its nature that we can get is attained by the "self-negation of the concept".[1] This inner life is "that into which we cannot look, which remains after the most complete and penetrating insight".[2] But after dwelling for some time upon this aspect of the question Fichte finally makes the conclusion—by a long and complicated argument,[3] which we cannot stop to consider—that this negative conception of the Absolute is not the true one. For if our Absolute is the negation of knowing, it can no longer be called absolute. That which "is determined by the negation of an opposite" is a "member of a relation" and hence is no true *Ansich*.[4] In conceiving the Absolute in this way we make it into an object, which we set over against ourselves. But in order to think of it rightly we must remove from our concept all such negative determination, such relativity. And we do this only when we cease to objectify the Absolute and instead identify ourselves with it, when we think of it, not as being, set over against knowing, but as "the living *Wir in sich*,"[5] a principle which lives in us and manifests itself through us.

In the conclusion which Fichte reaches here, he seems to have overcome more fully than elsewhere the difficulties in his later conception of the ultimate principle. The relation between this principle and human consciousness is here represented as very close. It must be remembered, however, that there are many passages in the later works in which Fichte takes the more abstract view of his ultimate principle, in which he insists that its *Ansich* is higher and truer than its *Fürsich*. It is because of the numerous statements of this sort that we cannot agree with those who declare that there is no real difference between the two periods; there is an important difference of emphasis. On the other hand, however, we have seen that the later works do not represent an abandonment of the doctrines of the earlier; for in the first place the teachings of the two periods are not necessarily antagonistic, and in the second place we find in each period traces of the prevailing doctrine of the other.

[1] *Cf.* the *Darstellung* of 1801: "Knowing . . . cannot contemplate its absolute origin without contemplating its boundary, its not-being" (*S. W.*, ii., 63).

[2] *N. W.*, ii., 150.

[3] *Op. cit.*, 170-202.

[4] *Ibid.*, 202 f.

[5] *Ibid.*, 206.

IV.—SOME NEW OBSERVATIONS IN SUPPORT OF THOMAS YOUNG'S THEORY OF LIGHT- AND COLOUR-VISION (III. Conclusion).

By W. McDougall.

Section VI.—Contrast, Induction and After-images of Coloured Light.

I turn now to the consideration of the phenomena of simultaneous contrast and induction and of after-images of coloured lights.

Helmholtz, in attempting to explain these phenomena, relies to a great extent upon the principle of psychological contrast, and attributes a very important part to the so-called 'Eigenlicht' of the retina. As regards the former the unprejudiced reader must admit that Helmholtz's reasonings do but establish the fact that psychological contrast sometimes plays some part and that Hering's observations and reasonings have proved that it plays at most but a minor part, and in some cases of contrast plays no part at all.[1] As to the important *rôle* attributed by Helmholtz to the 'Eigenlicht,' it has now been pretty conclusively shown that the 'Eigenlicht' is chiefly, if not wholly, of cerebral origin (see Müller, *op. cit.*, § 33). Further, the most casual observation will suffice to convince any one, whose 'Eigenlicht' has not a much greater brilliancy than mine, that it is utterly incompetent to produce the effects ascribed to it by Helmholtz. When, for example, on fixating a S disc on a bright W ground, the S becomes gradually almost as bright as the W ground and leaves, as in observation i., a brilliant W after-image, and when two such after-images inhibit one another alternately (observation xiii.) it would be manifestly absurd to attribute these after-images to the 'Eigenlicht' of the retina exalted by psychological contrast. Helmholtz, however, has been the chief modern exponent of Young's theory and his system

[1] See especially *Pflüger's Archiven*, Bd. 40, 41, 43.

of forced and unreal explanations of this large group of phenomena has come to be accepted by many, half unconsciously no doubt, as an essential part of the theory, and to this compound the name 'Young-Helmholtz theory' is commonly applied. The strength of this association is, I think, the principal cause of the want of popularity of Young's theory at the present time. For Hering having shown very convincingly the inadequacy of Helmholtz's system of explanations, many readers, in rejecting this part of the compound, have been led to reject the whole, and it is, I think, no exaggeration to say that the weakness of Helmholtz's explanations of these phenomena has been and is the main strength of Hering's theory. It is for this reason that it seems undesirable to associate Helmholtz's name with Young's in speaking of the theory proposed by the latter.

Simultaneous Colour-contrast.

The broad facts of simultaneous colour-contrast are that when part of the visual field is of one colour and the rest of the field is a grey, the grey tends to appear tinged more or less strongly with the colour complementary to that of the coloured area; this contrast-colour tends to be most strongly developed in the immediate neighbourhood of the coloured area; and a grey of about the same brightness as that area is most favourable to the appearance of the contrast-colour, while on a S ground, such as the opening of the dark-box, it is not perceptible; if the ground on which the coloured patch lies be also coloured in some other tone, this tone tends to be inclined towards the true complementary to the coloured area.

By the observations recorded in sections i., ii. and iii. I have endeavoured to show that the darkening contrast-effect exerted by a W area on adjoining grey areas is due to the inhibitory effect of the more vigorous cortical processes, excited by the W area, on the feebler cortical processes excited by the grey areas; and I have now to extend the same principle to the explanation of simultaneous colour-contrast. If the explanation is the true one in the case of the contrast effects of W, then it must also hold for colour-contrast, if Young's theory be true. For W being the resultant of simultaneous activity of the R, G and B colour-systems, inhibition of W by W must be expected to involve inhibition of R by R, G by G, and B by B. This is, I believe, the principle underlying the phenomena of colour-contrast.

In the cortical level of each colour-system the activity of any one part tends to inhibit the activity of all other parts, and when any one part is more intensely excited than the rest its activity does partially or completely inhibit that of all other parts of the cortical area of the same colour-system. (This relation between the parts of the cortical area of each colour-system is indicated in the diagram, figure 15, by the radiating arrows.) Suppose then that all parts of all three colour-systems are equally excited to a moderate degree, except that one small part of one system, say the R system, is more highly excited; this is the condition obtaining during fixation of a grey surface with a patch of R upon it. Then the activity of this more highly excited part of the R cortical area depresses that of the rest of the R cortical area, more especially that of the immediately surrounding parts, with the result that in the parts of the field surrounding the R patch the activity of the B and G systems predominates over that of the R, and the grey ground appears B − G. When the balance of the activities of the three cortical levels has once been turned in this way in favour of the B and G systems, the predominance of the B and G systems must be still further increased by that antagonism between the corresponding parts of the cortical areas of the three colour-systems which was demonstrated in the preceding section, *i.e.*, the activity of the R cortical area must be still further depressed or inhibited by that of the B and G areas.

I must diverge here to draw attention to the fact that the theory of contrast outlined above is not a new one. Since the first part of this paper was printed I have come upon three papers by Prof. Rollet,[1] in which, after criticising Helmholtz's and Hering's theories of contrast, he proposes one essentially similar to that suggested above. His words are "Das was bei allen Contrast-versuchen gleichmässig in Betracht kommt, ist also dass ein bestimmter Reiz der den Netzhautort *a* trifft und einen auf diesen Netzhautort bezogenen Eindruck von bestimmter Qualität zur bewussten Wahrnehmung bringt auch die Wirkung hat dass in einem gleichzeitigen Eindruck, welcher auf einen zweiten von einem anderen Reiz getroffenen Netzhautort *b* bezogen wird, ein aliquoter Theil der dem ersteren Eindrucke gleichnamige Componente entfällt, während derselbe vorhanden gewesen wäre, wenn auf den Ort β derselbe Reiz für sich allein bei übrigens ganz unerregter Netzhaut gewirkt hätte". Rollet claims the phenomenon of simultaneous induction of same-

[1] *Wien. Berichte.*, Bd. lv., 1867.

coloured light as a support to his theory, for he considers that the compound light of the grey ground is broken up by the contrast effect into two parts which make themselves felt alternately. In this last suggestion I cannot follow him, but it will be seen that in the paragraph quoted he formulates the theory of contrast sketched above, and that his presentation of it differs from mine only in that the processes concerned are conceived less definitely and in less detail.

Rollet's theory of contrast does not seem to have been favourably received, but it may be hoped that the new facts and points of view put forward in the foregoing sections have now prepared the way for its acceptance. I have also to record further observations directly supporting the theory. In observation x. I described how a patch of bright W light totally inhibits the consciousness of a duller patch of W light thrown upon the retina at some distance from the former. If this theory of contrast be the true one, it must

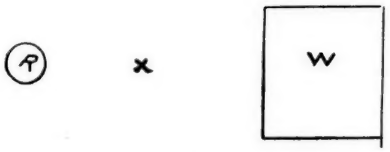

FIG. 21.

be possible to effect two variations of this experiment, it must be possible to observe under similar conditions the total inhibition of coloured light by W light and the total inhibition of one of the constituents of the sensation of W light by a patch of bright coloured light. I therefore made the following observations.

Observation XXXVIII.—Sunlight was reflected upon a plate of milk-glass fixed, as in the case of observation x., behind the photographic shutter and covered with S paper save for a circle 5 cm. in diameter. Outside the shutter two sheets of R gelatine were pinned over the aperture. At a distance of 30 cm. from the circle a sheet of W paper was pinned against the dark window-shutter (W in figure 21) and illuminated by dull diffused daylight. From a distance of 70 cm. I fixated a point × midway between the W paper and the circle. On opening the photographic shutter the circle, hitherto a dull W, becomes a bright R. If the shutter be opened in the first few seconds no marked change of

colour of W is perceptible, generally only a slight reddening of it through irradiation and reflexion of R light from my face. But if fixation be continued for fifteen seconds or more and the shutter then opened the W square becomes at once B-G of good saturation and slightly varying tone, the B and G seeming to struggle together slightly. The square remains B-G so long as the circle remains bright R and when the shutter is closed it brightens somewhat, loses its B-G colour and becomes faintly tinged with R. This I have repeated with the W square and the R circle at various angles apart, and it was then obvious that the contrast effect was greater the smaller the angle between them.

Here then we see inhibition of the R element of the W sensation (excited by the square) by the more intense R of the circle. But, under the conditions of the observation, the inhibitory effect is not strong enough to make itself felt unless the area of the R cortex corresponding to the W square be first fatigued by a fixation of fifteen seconds or more, just as was the case in observation x.

Observation XXXIX.—The W square of the preceding observation was replaced by a smaller square of W paper and on this was placed a still smaller square of R paper about 3 cm. in width, and the R gelatine was removed from the path of the sunlight, so that opening the shutter then gave a bright W circle. Using an artificial pupil, I fixated the point × as before for fifteen seconds and then opened the shutter. The R square and the dull W ground on which it lies both fade completely if the W light of the circle be bright enough, and return dimly on continued fixation. If the W light of the circle be made rather less bright, then on opening the shutter the colour of the R square disappears and the R and W paper become indistinguishable and appear as one dull grey square. If, on the other hand, the illumination of the R square is increased, then it does not disappear or become grey on opening the shutter, but its colour changes suddenly to pure G.

This last phenomenon is another case of the reversal of colour during prolonged fixation and its full explanation must be postponed. It is however clear that the main factors are as follows: During the preliminary fixation the area of the R cortex excited by the R square becomes fatigued while the corresponding area of the G cortex is hardly at all fatigued, for the G system is more feebly excited in the retina and its cortical processes are partially or wholly inhibited by the dominant activity of the R cortex. When then the activity of this fatigued area of the R cortex is

inhibited by that of the area excited by the bright W light, the corresponding area of the G cortex springs into activity. That the G alone makes itself felt without the B is probably due to the relatively greater vigour of the G systems of my eyes.

When the image of the R square fades completely on exposing the bright W light, this can only be because the excitement of one part of the R cortex by the bright W light is more intense than that produced in the other area of it by the dull R light, and therefore predominates over and inhibits it.

We are now in a position to understand more fully observation xxiv. In that case we saw that a colour of low saturation on a grey ground becomes less perceptible and may become invisible when the grey ground is replaced by a W one. Now it is obvious that if the W sensation be determined by an altogether separate and independent process as Hering claims, then it should exert upon a neighbouring coloured area no other contrast-effect than a mere darkening of it, except that in the case of a colour of low saturation (in Hering's phraseology—a colour mixed with much light grey), such as was used in observation xxiv., the W ground should, by diminishing the proportion of W mixed with the colour, render the colour more saturated and more easily perceptible than when it is upon a grey ground—the reverse of the effect actually produced.

There is another feature of observation xxxviii. that is quite inexplicable by Hering's theory of contrast. When the bright R light is exposed the B-G colour appears upon the dull W patch only and not at all over the rest of the field. Now the rest of the field is a very dark grey, and if the R light really produces its contrast effect by inducing increased assimilation of a R-G substance in the surrounding areas the complementary contrast-colour should appear at least equally, if not more, vividly over all that part of the ground that lies at a less distance from the R circle than the W square does.

Rollet's theory of contrast, on the other hand, does not expect any such appearance of B-G on the dark ground, for where there is no appreciable activity of all three colour-systems an inhibitory effect exerted upon one of them cannot cause the other two to affect consciousness. Rollet's theory then explains admirably why it is that the grey, upon which simultaneous contrast-colour most readily and markedly appears, is one of about the same brightness as the contrast inducing area.

Prof. Ebbinghaus[1] offers the following explanation of the absence of contrast-colour on a dark ground :—every patch of coloured light tends to be surrounded by a same-coloured halo due to diffusion of the coloured light in the media of the eye. This colour, due to diffusion, asserts itself, he says, relatively more when no objective light comes from the ground surrounding the coloured patch than when that ground is a grey, therefore when the ground is dark the contrast-colour may be neutralised or even reversed by the effects of this diffused light. But to try to help Hering's theory out of its difficulty by this argument involves a logical error, a begging of the question in dispute, for if the colour due to diffusion of light shows up best on dark ground why should not also the colour due to contrast show up best on the same dark ground? Ebbinghaus assumes for his explanation that the colour due to contrast and that due to diffused light are differently affected by mixture with the light from a grey ground, but this is just the point that has to be explained.

The observations recorded above are then quite incompatible with Hering's theory or other form of the 'Gegenfarben' theory, while they are just such as are demanded by Young's theory of light- and colour-vision and by Rollet's theory of contrast.

Simultaneous Induction.

The phenomenon of the simultaneous induction of coloured light resembles closely that of W light. It consists in the appearance of the same colour around a patch of any colour when it has been steadily fixated for some little time, generally ten seconds or more. It may appear on a surrounding grey ground on which the contrast-colour has not been perceptible or it may appear as a sudden reversal of the contrast-colour. The longer fixation is continued the brighter the induced light becomes and the further it spreads away from the inducing patch of light over the ground. The principal argument that I directed against Hering's theory of the causation of the simultaneous induction of W light (section iii.) applies even more strongly in the case of coloured light. For the same colour is induced most readily on a ground of S velvet or on the intense S of the dark box, and least readily or not at all on a ground which shows a well-marked contrast-colour.

[1] *Grundzüge d. Psych.*, p. 223.

The following observation brings out the contest of two factors of different nature and independent of one another, the contrast effect and the induction of same-coloured light.

Observation XL.—I laid a sheet of R paper, with a hole 3 cm. square at its centre, on a smooth grey surface of about the same brightness. On fixation of a point at the centre of the grey square with one eye only and relaxed accommodation, the square appears a fairly bright G of low saturation. After twenty seconds' fixation there becomes perceptible on the square a vague struggle of R and G in tiny points, G predominating for the most part. This appearance seems to persist as long as fixation is continued under the same conditions, but if at any moment I increase my accommodation (which of course involves a narrowing of the pupil) the R ground becomes either G or a neutral tone, according to the degree of accommodation and narrowing of the pupil, and in either case the square becomes at the same moment a bright R of fair saturation.

In section iii. I have argued that the appearance of simultaneously induced light is due to the diffusion, out of the retinal area affected by the light-rays into the surrounding parts of the retina, of the X-substances set free by the light-rays. In the case of coloured light we have to assume that light of any particular colour, say R light, sets free more of the R X-substance than of the B and G X-substances. The R X-substance, therefore, diffuses into the adjoining area in larger quantities than the G and B X-substances, and spontaneously exciting the nerve-endings of the R-system in these parts of the retina tends to give rise to a sensation of R surrounding the fixated patch of R.

In the above case (observation xl.), then, so long as the R ground is seen as R, it inhibits the activity of the R-system in the area of the grey square, and so prevents the appearance of the simultaneously induced R, and the diffused R X-substance makes itself felt only by neutralising more or less the contrast-colour; but when, owing to the narrowing of the pupil, the colour of the R ground is reversed, or even only the predominance of the R abolished so that the ground becomes neutral, the diffused R X-substance is able to produce its full effect on the cortex, and the induced R appears pure and unmixed with the contrast-effect.

A similar effect may be observed if, after fixating the centre of a patch of grey on a R ground for thirty seconds or more, the eye be brought nearer to the point fixated. There appears at once a zone of G forming the border of the square, and the remainder of it stands out as a R patch. In this

case, when the eye is brought nearer, the R of the ground no longer immediately adjoins the retinal area into which the R X-substance has diffused itself, its inhibitory influence on the R cortex of this area is therefore weakened and the excitement of the R system (by the diffused R X-substance) is then able to spread through the cortex and affect consciousness.

The After-Images of Coloured Lights.

I have made many series of observations of the after-images of coloured lights. Some of these I have already described summarily in section iii., but, before discussing the causes of these after-images, it is necessary to describe in some detail a complete series of observations, in order to show clearly the inadequacy of the explanations offered by Hering and by Helmholtz and to give a sufficient basis of facts for the discussion.

In attempting to arrive at an understanding of the factors concerned in the production of these so various and perplexing appearances, it seems desirable to study them under the simplest possible conditions. By using as the source of light a shaded disc, such as is described in section iii., and by observing the after-image following fixation of it in complete darkness, two obvious sources of complication and confusion may be avoided. When a sharply bounded patch of light is fixated the after-image of it is complicated by the presence of some halo. The halo not only affects and so complicates the pure after-image effect, but has led to the confusion in description of after-images as positive and negative according as they are brighter or darker than the surrounding ground. The projection of an after-image on to a grey surface complicates the effects in two ways; firstly, the rays from the ground modify the action in the retina of the X-substances remaining there and set free more X-substances, secondly, the activity of the ocular muscles during projection is unfavourable to the free play of rivalry among the colour-systems, inasmuch as it tends to prevent 'complete fading'.

Both these complicating influences favour, for reasons that I shall explain below, the appearance of a complementary coloured after-image.

The after-images described below were therefore observed under these simplified conditions.[1]

[1] A piece of apparatus, which may be called a portable dark chamber, is very useful in the study of after-images. It consists of the following parts: a piece of 1 inch plank, 18 inches in width, and 2 feet 6 inches in

Observation XLI.—I observed the after-images given by R, Y, G, G-B, B and P lights, at three different intensities for each colour. In each case the after-image followed the fixation for sixty seconds of a point at the centre of the shaded disc.[1] The disc transmitted light from the sky or sun, the light being coloured by passing through one or more layers of coloured gelatine pinned over the aperture in the window-shutter, behind which the photographic shutter and glass-plates were set up. At each of the three intensities I attempted to make the different colours of about equal brightness and saturation. The colours of the lowest degree of brightness were given by the light from a grey sky falling through one or two sheets of gelatine and the plate of milk-glass. They were of about the lowest degree of brightness that will give a coloured after-image in the dark, and after fixation lasting less than fifteen seconds they give grey after-images only. The colours of the second degree of brightness were given by sunlight falling through five to eight sheets of gelatine and the plate of milk-glass. These were bright colours of good saturation. The colours of the third degree of brightness were given by sunlight falling through a shaded disc of ground-glass covered by only two or three sheets of

length; a square board of well-seasoned timber, 2 feet 6 inches in width, stands vertically upon this plank, its lower edge is let into a slot running along the middle of it, and it is held firmly in position by angle-pieces. A little above its centre, the square board has a circular hole, 3½ inches in diameter. At the top corners of the board a pair of light wooden rods are attached by hinges and can be fixed so as to project horizontally from it, parallel to one another, and at right angles to the plane of the board. Two pieces of black cloth, the inner one of black velvet, the outer of black linen, each about 3½ yards in length, are tacked by one edge to the top and sides of the square board and spread over the horizontal rods. A strip of cloth about 1 yard wide tacked by one edge to the base-board and a back-flap of black velvet complete the walls of the chamber. The base-board being placed upon a table at one edge the observer sits within the curtains with his eyes at the level of the hole in the vertical board, and by sitting upon the free ends of the curtains can completely exclude all light. On the inner surface of the vertical board, above and below the circular hole, are two pairs of projecting ledges to hold the photographic shutter and the glass plates. Where no dark room is available this simple piece of apparatus can be made to serve many of the purposes of one. It can also be used as a 'Dunkel-Tonne,' and even where a dark room is available this dark chamber presents the advantage that it can be placed so as to receive the direct rays of the sun through the hole in the vertical board. I have made a second example with two apertures about 9 inches apart in place of the one, each being filled with shutter and glass-plates. This is in many ways a great improvement. I find the Thornton-Pickard shutter for time and instantaneous exposures well suited for use in such a chamber.

[1] This disc is described in observation xvi., section iii.

gelatine. These were so bright as to be a little trying to the eyes and were of lower saturation than those of the second degree of brightness. In the following paragraphs the colours of these three degrees of brightness are referred to as the dull, the bright and the very bright respectively.

In the after-image the part corresponding to the shaded border of the disc is for the most part coloured differently and frequently complementarily to the brighter central area, but it is in all cases so much less bright than the latter that it is incapable of affecting it appreciably. It is therefore neglected in the following descriptions of the after-images of the bright central area of the disc.

Dull R.—After-image,—G in first half-second, then R three seconds, turning rapidly to pure B on which patches of G soon appear. The patchy B and G persist sixty seconds.

Bright R.—After-image,—bright pure G two seconds, followed by B three seconds, then B and G struggle for fifteen seconds, after which a dull B-G gradually fades away in two minutes.

Very Bright R.—During fixation the R loses saturation rapidly, and towards the end specks of B and G appear upon it. After-image,—bright R seven seconds, orange R thirty seconds, orange struggles on G ground seventy seconds, pure dark G fading away in ninety seconds and showing traces of B at moments.

Dull Y.—After-image,—a reddish blur of light in first second, then pure G for four seconds, after which patches of B appear and a struggle of dull B and G persists to the end.

Bright Y.—After-image,—bright B of very low saturation two seconds—then R, which after five seconds begins to become tinged with B and passes through P and B to a patchy B-G that persists to the end.

Very Bright Y becomes during fixation a bright pure R after a few seconds. R persists only five seconds and then passes back rapidly through Y to pure bright G, which persists. After-image,—bright Y, becoming more G until after fifteen seconds it appears as G struggling upon R ground. The struggle continues sixty seconds, the G retreating towards the centre and breaking up into patches. Then pure R thirty seconds, then short period of struggle of R and B in which they alternate completely several times and B triumphs and persists forty seconds and then gives way to dark G, which slowly fades away.

Dull G.—After-image,—P disc fading gradually in eighty seconds without change of colour.

Bright G.—After-image,—bright G seven seconds, then changes to a bluish P, which becomes more B until pure B only remains and persists to the end.

Very Bright G becomes B-G towards the end of the fixation. After-image,—bright G lasting, with a few momentary appearances of R patches upon it, for 120 seconds, then G struggles in patches upon R ground for about sixty seconds, then pure R for thirty-five seconds and then dull B fading slowly away.

Dull B-G.—After-image,—B-G four seconds, then R, which passes rapidly through dull orange and Y to G and so fades slowly.

Bright B-G.—After-image,—G two seconds, R five seconds, then B fading slowly away.

Very Bright B-G.—After-image,—bright B-G ten seconds, then pure bright G, with a few momentary appearances of patches of B on it, lasts fifty seconds and then struggles upon and yields to R, which persists alone and pure thirty seconds; then R struggles on B for thirty seconds, B predominates and persists alone twenty seconds and then gives way to dull G, which fades away in about fifteen seconds.

Dull B.—After-image,—B of low saturation three seconds, then passes in ten seconds through P, R and orange to dull Y, which fades away in forty seconds.

Bright B.—After-image,—B five seconds, P five seconds, then Y-G, fading away in about seventy seconds.

Very Bright B.—After-image,—bright B of low saturation ten seconds, then B struggles upon bright G ground sixty seconds, then pure G disc with R edge. After forty seconds G gives way to the R, which persists seventy seconds and then gives way after a short struggle to B. B persists forty seconds and then gives way to patchy dark G which fades slowly away.

Dull P.—After-image,—P two seconds, then Y-G, becoming rather purer G and fading in forty seconds.

Bright P.—After-image,—bright P twelve seconds, then Y-G, rapidly becoming pure G and fading in ninety seconds.

Very Bright P.—After-image,—bright P of low saturation, rapidly resolving itself into B struggling upon a R ground. After thirty seconds B yields to R, which persists alone and pure twenty seconds and then struggles upon and yields to G, which fades slowly away.

Besides the above series I have made a great number of observations of the after-images following the fixation of lights of all colours and brightnesses for periods varying from two seconds to two minutes, and in some cases for

very much longer periods, and I have used both the shaded and half-shaded and the sharply bounded disc. For the very bright colours the half-shaded seems to give just as good results as the fully shaded disc, but for the less bright colours it is important to use a disc which has a broad and perfectly smoothly shaded border, in order to avoid complication of the after-image by halo effects.[1]

The after-images described above are typical specimens of those that follow the fixation of the shaded disc. I do not mean that the order of appearance and duration of the different phases are constant, for, in the case of after-images following the less bright colours especially, very slight changes in the conditions may alter the after-image very considerably. But certain features that are quite constant may be summed up as follows: (1) The after-images of the coloured shaded disc show in nearly every case a play or succession of colours, in which each of the three colour-systems makes itself felt in some phase. (2) The brighter the coloured light fixated, the brighter are the colours of the after-image, and the more keen is the antagonism between the different systems, so that the colours fuse less than in the after-image of duller colours; and when the colours are very bright the three simple colours, R, G and B tend to appear pure and saturated in turn in a recurring cycle, the unchanging phases of pure colour being separated by periods of struggle between the fading and the succeeding colour, just as is the case in the after-image of bright W light. (3) In the case of fixation of one of the three simple colours, R, G and B, the lower intensities are followed by after-images in which the other two colours predominate, more or less fused together, *i.e.*, the after-image is predominantly complementary coloured; while when the colour fixated is very bright the first phase of the after-image is usually same-coloured and of considerable duration. The like holds true for the compound colours but in their case the phases of the after-image tend to be rather more varied. (4) The order of occurrence and the duration of the different phases varies readily with slight variations in the conditions. The last feature is well illustrated by the following observation.

Observation XLII.—The shaded disc of milk-glass covered with two sheets of G gelatine and exposed to a bright grey sky appears as slightly yellowish G of fair saturation and brightness. Every period of fixation of this disc from ten to

[1] Such a perfectly smoothly shaded border may be best obtained by passing the light through a shaded disc of ground-glass and then through a plate of milk-glass, fixed about half a centimetre behind the ground-glass.

sixty seconds was followed immediately by pure B of fair saturation which gives way to R after from three to five seconds. I then removed one sheet of G gelatine and so caused the G disc to appear slightly brighter and slightly less saturated. Every period of fixation from ten to sixty seconds was then followed immediately by G, which after five to ten seconds gave way to R. The R persisted to the end but in the case of the longer fixations became mixed with B.

I then put over the disc a sheet of dark cardboard with a hole in it through which the bright centre only of the shaded disc was visible. Every period of fixation from ten to sixty seconds was followed immediately by R which passed slowly through P to B.

In this case then the same colour-tone, G, was followed immediately by B, G or R according to slight changes in the conditions of fixation. The observation also illustrates the fact that the presence of a sharp margin to the patch of light fixated favours the predominance in the after-image of the complementary colour.

I have stated above that projection of the after-image of coloured light on to a W or grey ground favours the predominance of the complementary colour. This fact is illustrated by the following observation.

Observation XLIII.—The very bright R shaded disc was fixated sixty seconds. The after-image in the dark was R and on projection on to a dull grey surface (a sheet of W blotting paper in dim light) it remained R, but on increasing the illumination of this surface the after-image became at once G, and on again diminishing the illumination it became R again; and this reversal of the same-coloured after-image by projection upon a W surface occurs constantly if the W surface be bright enough.

One other feature of the after-images of coloured light of medium intensity must be mentioned here. With any given light, the vividness and the duration of the after-image, observed in the dark, increase with increase of duration of fixation of the light from about ten seconds up to about ninety or one hundred seconds, but with further increase of the period of fixation the duration and vividness of the after-image not only do not further increase but diminish, so that after very prolonged fixation the after-image is either dull and of short duration or not to be seen at all.[1]

[1] Mr. G. J. Burch has observed the effects of exposure of the eye to very bright coloured lights and his observations and conclusions seem to be in harmony with my own, save that he is led to regard violet as a fourth kind of simple colour-sensation (see *Proc. Roy. Soc.*, vol lxiii.).

The Relation of the After-image to Its Halo.

If a sharply bounded patch of coloured light be fixated for more than a few seconds the after-image of it is usually surrounded by a halo. As in the case of the after-image of W light, the halo seems to be due to the persistence in the retina of the diffused X-substances to which the appearance of the simultaneously induced light is due. If the coloured light fixated is not very bright and the fixation not very prolonged the halo is of the same colour. But the longer fixation is continued the brighter and the less saturated is the colour of the halo, until after a prolonged fixation it becomes W or even tinged with the complementary colour and is so much brighter than the after-image itself as to inhibit it partially or wholly. The colours of the after-image and of its halo tend to be complementary to one another, for during the observation of an after-image in the dark the conditions are very favourable to contrast-effects,—there is unchanging or only very gradually changing retinal stimulus and there is no reinforcement of the cortical processes by activity of the ocular muscles. On projection on to a W ground the halo is reinforced more than is the after-image, so that, in the case of an after-image bright enough to inhibit its halo wholly or partially in the dark, projection on to a W ground may cause the halo to predominate over the after-image. These features of their relation are illustrated by the following observations.

Observation XLIV.—I put a plate of ground-glass behind the photographic shutter in the dark cabinet (described above, p. 355) and on the centre of the plate an opaque black ring, 1 cm. in width and having an internal diameter of 1 cm. On allowing the light of a strong lamp to pass through a sheet of R gelatine and the glass plate, there appears a broad dark ring upon the centre of a bright R ground. By this arrangement the halo-effects are produced in the area of the dark ring more vividly than on a dark ground merely surrounding a patch of coloured light. On fixation of a point at the centre of the ring, the dark ring appears slightly G in the first few seconds and then rapidly becomes R. If the after-image be observed in the dark after five or ten seconds' fixation the ring appears as a R of good saturation on a B-G ground; after twenty seconds' fixation the ring appears in the after-image a brighter and less saturated R; after forty seconds it is a very pale bright R, after sixty seconds it is W, and after ninety seconds' fixation it is a bright very pale G, *i.e.*, W tinged with G. The B-G ground

is duller in proportion to the brightness of the R and is partially inhibited by the brighter ring, for when, in the after-image following sixty or ninety seconds' fixation, the bright ring occasionally fades for a moment, the ground starts out more brightly in the same moment.

Observation XLV.—The glass plate used in the preceding observation, with the same dark ring upon it, was exposed to bright direct sunlight, without any coloured gelatine interposed. On fixating the centre of the ring the very bright W ground darkens during the first ten seconds and then begins to become B-G and after another ten seconds appears as a very saturated intense B-G. After fifteen seconds the B-G of the ground begins to struggle with R and very soon gives way to a pure R, also of good saturation. During this time the dark ring, at first showing only a faint brightness due to irradiation, becomes continuously brighter until after fifty seconds it is of about the same brightness as the ground. While the ground is B-G the ring is R of low saturation, and when the ground becomes R the ring becomes B-G of low saturation. On excluding all light after fifty seconds' fixation, the after-image is absent during the first two or three seconds, and then appears as a W ground with the dark ring upon it, and brightening rapidly and turning G. The ground remains bright G for forty seconds, and during this time the ring brightens and becomes R; then, after a short struggle, the G of the ground gives way to R, and the ring becomes G and is now about as bright as the ground. If during the earlier stage of the after-image, in which the ring appears dark on a bright G ground, it be projected on to a dull W surface, the ring becomes a bright W, while the G ground is only dimly perceptible, and throughout the course of the after-image projection of it on to a W ground has the effect of reinforcing the ring, so that it predominates over and more or less inhibits the colour of the ground.

Theory of After-images.

Any theory of after-images must account for all those features of the after-images of coloured lights enumerated on page 359, and also for those features of the halo and of its relation to the after-image described above; and it must also be brought into relation to the explanation of the phenomenon of reversal of colour of a fixated patch of coloured light on diminution of its brightness, on simple prolonged fixation and on adding W light to it; for clearly the reversal

of colour in these cases is closely related to, *i.e.*, is determined by much the same factors as determine, the appearance of the complementary coloured after-image.

Hering's theory is quite incapable of accounting for some of the most striking and fundamental of these facts. His theory demands that a coloured light be followed, if by any after-image, by one complementary in colour to the light fixated, and the more intense the colour and the longer the fixation the more vivid and persistent should the complementary colour be. For the greater the amount of dissimilation brought about by the action of the light rays the greater must be the tendency to assimilation in the period following their action, and conversely. Müller's improved form of the theory makes the same demands, for the passage quoted in section iii., page 73, applies to R and G and to Y and B as well as to W and S. But we have seen that same-coloured after-images occur, under suitable conditions, with just as great constancy as do complementary coloured under other conditions, and it is precisely when the coloured light is intense that the same-coloured after-image appears most constantly, while prolongation of the fixation of coloured light beyond a certain point not only does not increase the vividness and duration of the complementary after-image but diminishes them. Nor when the after-image is other-coloured is it constantly complementary coloured; when the coloured light is very bright the three pure colours tend to succeed one another in a recurring cycle, as in the after-image of bright W light; and when the light is not very bright and the after-image is other-coloured it is frequently far from being complementary coloured,—thus I have frequently observed a pure bright R light to be followed immediately by a pure B after-image lasting many seconds, and in such a case adding B to the R light does but increase the predominance of B in the after-image. It is perhaps hardly necessary to point out in detail how Hering's theory fails to explain many other of the features described above. The fact is that in dealing with the after-images of coloured light, just as we have seen in the case of the after-images of W light, Hering's theory appears plausible only so long as we confine our attention to the after-images given by slips of coloured paper or lights similarly restricted in range of intensity and conditions. Hering has seemed to recognise this and has entered the following protest against the use of lights of higher intensity: 'Vor der Anwendung einer irgend starken Beleuchtung muss bei diesen wie bei allen folgenden Versuchen ganz besonders gewarnt werden, weil man dadurch

nicht blos seine Augen angreift, sondern, was das eigentlich Wesentliche ist, *ganz andere und sozusagen unreine Resultate bekommt.* Wie es nicht zweckmässig wäre, die Untersuchungen über den Wärmesinn damit zu beginnen, dass man übermässige Hitze oder Kälte auf die Haut wirken lässt, so ist es auch methodisch falsch, die Netzhaut mit intensivem Lichte zu blenden, wenn man ihre sozusagen normale Thätigkeit untersuchen will.'[1] That is to say that results that do not lend themselves readily to his explanations are to be regarded as impure and negligible. Surely a somewhat dangerous principle in scientific research!

It may be retorted too that we wish now, not merely to begin the study of light- and colour-vision, but to arrive at definite views as to the physiological processes involved, and that to restrict ourselves in the course of this study to lights of so limited a range of intensity, as Hering desires us to do, would be like attempting to make a complete investigation of the temperature-sense without ever experiencing affections of that sense other than gentle warmth and coolness. Even if the observations recorded above involved the use of lights so bright that their effects must be considered more or less pathological, a true theory of vision must still be capable of accounting for them. But I do not think that the lights used can be considered to be of this nature, for, as I have mentioned above, I have experienced but very slight evil effects from their use, and these resulted rather from very prolonged fixations of lights of medium intensity than from fixation of brighter lights.

The explanations of the after-images of coloured lights suggested by Helmholtz are, if possible, even less satisfactory than those suggested by Hering. Helmholtz's explanation of same-coloured after-images consists in the simple statement that the condition of excitement persists after the light ceases to act, that 'der Reizungs-zustand noch eine Zeit lang dauert'.[2] The complementary after-images were ascribed by him to fatigue of the retina, to a diminished excitability of the retinal area affected for the kind of stimulus previously applied. This explanation has some plausibility and probably some truth in the case of after-images projected upon more or less brightly lit surfaces; but we are asked to believe that, in the case of similar after-images seen with closed and covered eyes, the colour is an expression of the fatigue of that part of the retina towards the

[1] *Zur Lehre vom Lichtsinne*, S. 4 (italics are mine).
[2] *Phy. Optik*, 2nd ed., p. 508.

inner stimulus to which the 'Eigenlicht' is due. By any one to whom, as to me, complementary coloured after-images may appear in the dark so very much more vivid than any 'Eigenlicht' this suggestion cannot be entertained for a moment. Further, it is not obvious why, according to Helmholtz, a bright colour, fixated for as long as sixty seconds, should usually be followed by an after-image that is same-coloured even when projected upon a W surface. For fatigue must be considerable in such a case, and if it be a dominant factor the after-image should be complementary coloured.

While, then, Hering's theory is incapable of accounting for positive and same-coloured after-images, Helmholtz's is equally incapable of explaining complementary coloured after-images seen in the dark, and both these theories of after-images stand condemned by the fact that their authors are driven to ignore or make little of a large number of the phenomena that any such theory must account for.

In offering the following account of the processes underlying the phenomena of after-images I do not presume to claim that it is correct in every particular, but I claim that the main outlines are correctly drawn and that the processes actually concerned are indicated, although the relative importance of the part played by each factor may be incorrectly estimated. For all the processes are incapable of being directly observed or indirectly observed singly, and their nature can only be inferred from the complex results produced in consciousness by their common action under different conditions. Although the account is complicated, I do not think that it is too complicated relatively to the facts to be explained. So complex and various a group of phenomena must depend upon complex causes.

In the case of the after-images of W light, I have already in section iii. shown reason to believe that they are due primarily to the persistence in the retina of exciting-substances, or, as I have called them, X-substances, set free in it by the action of the light-rays. I believe that the same principle underlies all after-images, *i.e., that all after-images, negative and positive, same-coloured and complementary-coloured alike, are primarily due to the persistence in the retina of X-substances set free in it by the action of the light rays on stored up mother-substances. These X-substances continue to act upon the endings of the optic nerve in the retina and thereby to be used up gradually. In the dark the relative intensity of the action of any one of the different X-substances is chiefly a function of the quantity of that substance present in unit area of the retina. The frequently occurring changes in the brightness and colour of parts of after-*

images are, with the exception of the gradual diminution of intensity due to the using up of the X-substances, all determined by changes in the cortex and not by changes in the retina.

I must recall here the account given in section iii. of the effects of the action of W light on the retina. Evidence was there brought forward to show that when W light falls upon an area of the retina it sets free in that area X-substances that are capable of exciting the nerve-endings in the absence of light, but whose action is accelerated by light rays.[1] These X-substances must be assumed to be of four kinds, the W, R, G and B X-substances, each of which acts upon the retinal nerve-endings of the W, R, G and B retino-cerebral systems respectively. In the case of light of more than low intensity the W system and the W X-substance (which is set free in the rods only) play a part of relatively small importance and may be neglected in the present discussion. Since there are two distinct stages in the chemical processes leading to stimulation of the nerve-endings, a first stage of setting free of the X-substances and a second stage, that in which they actually excite the nerve-endings, it is obvious that R (G or B) light may cause the predominance of the activity of the R- (G or B) system in one of three ways. To avoid confusion I will speak of the effects of R light only, with the understanding that what is said of R is meant to apply to B and G equally. R light, then, might cause the activity of the R-system to predominate (1) by setting free the R X-substance in larger quantity than the B and G X-substances while reinforcing the exciting action of all three equally; or (2) by setting free the three X-substances in equal amounts but reinforcing the exciting action of the R more than that of the B and G X-substances; or (3) by exerting a more vigorous effect upon the R substance in both stages.

In all cases of coloured light not of high intensity the facts enable us to decide in favour of the third of these possibilities. That R light sets free in the rested retina more R than G or B X-substances is shown by the phenomenon of simultaneous

[1] In section iii. I neglected to point out a fact that bears out this view of the nature of after-images, the view that they are due to the action of diffusible X-substances remaining free in the retina. This fact is that a sharply bounded after-image loses its sharpness of outline and distinct parts tend to run together like wet paints, in the words of Ebbinghaus (*Grundzüge d. Psych.*, S. 420), 'Sharp corners round themselves off, regular curves become irregular, one has just such an impression as though a substantial something spreads itself out slowly into its surroundings'. This substantial something is of course the diffusible X-substances.

induction of R light. If the appearance of the R light round about a patch of R, after fixation of it for some seconds, is due to R X-substance diffusing out of the directly affected area in larger quantity than the G and B X-substances, this can only be because the former is set free in the area in larger quantity than the latter.

The proof of the selective action of R light on the second stage of the retinal process is not so simple. It consists in certain facts that show that, during continued fixation of R light, the preponderance of free R X-substance over free G and B X-substances which, as we have seen, obtains in the early stage, is not maintained, but that the free G and B X-substances become at least equal in quantity to the free R X-substance, while, nevertheless, the R sensation continues on the whole to predominate over the G and B sensations. For if the amount of free R X-substance becomes less than or only equal to that of the B and G X-substances, the continued predominance of the R sensation must be due to the R light reinforcing the action of the former more than the action of the latter. The facts that prove the relative increase of the free G and B X-substances in an area of the retina during the continued action of R light upon it are the following: (1) The induced light, at first R, loses in saturation as it gains in brightness until it becomes W or slightly tinged with G (observation xliv.); (2) the phenomena of reversal of R light to G-B or G during continued fixation, either on diminishing its brightness or on adding W light to it (observation xxxiv.) or on simple prolonged fixation (observation xxx.); for these reversals, which only occur after fixation of some duration, show that the G and B systems begin to contend more and more nearly on an equal footing with the R-system as fixation is continued, and this seems to be due to the increase of the free G and B X-substances relatively to the amount of free R X-substance; (3) the predominance, sometimes complete, of the G and B systems in the after-image of R light of medium brightness indicates the same fact.

We have next to inquire: Why is it that, although the free R X-substance is present in greater quantity at first, the G and B X-substances become, as fixation is continued, equally or more abundant? We cannot, I think, ascribe it to a fatigue of the process of setting free of the R X-substance, *i.e.*, to a using up of the available R mother-substance, for there are facts that indicate that such fatigue is not easily induced. All accumulation of X-substances in the retina must be due to an excess of the first, the setting-free process, over the

second, the using-up process. Now we find that the brighter the light fixated the brighter is the after-image and the longer its duration, *i.e.*, the greater is the accumulation of free X-substances in the retina; and, in fact, we only find indications of fatigue of the first process in the case of stimulation by excessively bright light, as by direct sunlight (see observation xxiii.). Some other cause must therefore be sought.

It is obvious that if the action of R light is more selective on the retinal processes of the second stage than on those of the first stage, the relatively greater accumulation of the G and B substances must result on continued fixation; *i.e.*, if the R, G and B X-substances are set free by R light in a certain proportion, say in the proportion 3, 2 and 2, and are used up under the influence of the R light in the proportion 4, 2 and 2 owing to the greater selectivity of its action on this process, the more rapid accumulation of the G and B X-substances must occur. Here, we have, I believe, the key to the explanation of all the phenomena, the complementary coloured after-images and the various cases of reversal of colour, that depend upon this relative increase of the free G and B X-substances. It must be confessed that we have no direct evidence for this greater selectivity of the action of coloured light on the retinal process of the second stage. The assumption is as purely hypothetical as Hering's assimilation and dissimilation processes, still, it is not the key-stone of Young's theory.

But another factor plays a part also in the production of these phenomena. Although we cannot postulate fatigue of the retinal process of the first stage, for the reasons already given, we must recognise it in the case of the processes of the second stage. In section iii., page 76, I have stated that the after-image of W light is the more vivid, in the first moments after exclusion of the light, the shorter the period of fixation, but declines in vividness the more rapidly. This can only be explained, I think, by assuming a fatigue of the retinal process of the second stage. It is true only for short fixations, ranging from about half a second up to about ten seconds, for W light of medium intensity. There seems to be a period of fixation of from five to ten seconds that gives an after-image of minimum brightness; and a longer period of fixation gives a brighter after-image, because the greater accumulation of X-substances more than compensates for the fatigue of the process of the second stage,—it seems that the first few seconds of fixation blunt as it were the first keen edge of preparedness of the tissue. To this fatigue of the

process of the second stage we must ascribe the rapid fall in intensity of the sensation during the first few seconds, when we fixate a patch of bright W light. To the question of the part played by fatigue of the retinal process of the second stage I shall return below in another connexion.

Closely connected with the greater liability to fatigue of the second retinal process than of the first is the fact that, while the amounts of X-substances that can be set free seem to be practically unlimited and to continue to increase with the brightness of the light falling on the retina, the processes of the second stage rapidly approach a maximum activity as the light is brightened, and reach a limit beyond which increase of brightness of the light does not increase the activity of the process. The former fact is indicated by the increasing brightness and duration of the after-image as the light fixated is made more and more excessively bright; the latter by the diminution in saturation of colour as the brightness of a coloured light is increased, until the activity of the second retinal process of all three systems reaches a maximum and the light is seen as a W light in spite of the preponderance of rays of one wave length. What was said above of the greater selectivity of R light, in its action on the second than on the first retinal process, holds therefore only of R light of low and medium intensity, while with increasing brightness of the R light the relation becomes reversed and very bright R light exerts no selective action on the processes of the second stage, but only on those of the first.

A corollary from this proposition is that the more intense the light the more the first retinal process exceeds the second in activity. This is directly proved by the fact that the brighter the light the brighter and the more prolonged is the after-image, for the brightness and duration of the after-image are the expression of the amount of X-substances accumulated in the retina during fixation, *i.e.*, the expression of the excess of the first over the second retinal process.

For the explanation of the complementary coloured after-image and of the phenomena of reversal of colour of R light of medium brightness we have, then, three factors, namely, cortical fatigue, fatigue of the retinal process of the second stage, and the relatively greater accumulation of the G and B X-substances.

We have further to realise that the preponderance of the retinal excitement of the R system over the excitement of the B and G systems is probably slight, even while we experience a sensation of R of good saturation. For, owing to the mutual antagonism between corresponding areas of the

cortex of the three colour-systems, any predominance of the excitement of one system in the retina is greatly exaggerated in the cortex.

After fixation of a patch of R light of medium brightness for about sixty seconds we have, then, the following state of affairs set up in the corresponding areas of the three colour-systems affected : The quantity of G and B X-substances, free in unit area of the retina, is about equal to or perhaps even greater than the quantity of R X-substance ; the second retinal process of the R system is fatigued to a certain extent and the R cortex is very considerably fatigued, while in the G and B systems there is but very little or no fatigue at either level ; the predominance of the R in consciousness is being maintained by the selective action of the R light upon the second retinal process, *i.e.*, by the greater reinforcement of the action on the retinal nerve-endings of the R than of the B and G X-substances.

If at this time the R light ceases to reach the retina the B and G systems (or one or other of them) at once predominate over the R system, because the B and G X-substances are not inferior in quantity to the R X-substance, and act upon systems relatively unfatigued as to both the cortex and the second retinal process. We see then a B-G or, in some cases, a B or a G after-image of the R light.

In the same way, if the brightness of the R light be diminished, the balance is turned in favour of the B and G systems, so that their cortical activity predominates over that of the R system and depresses it and the R light appears B-G. For, by the diminution of brightness of the R light, the reinforcement of the second retinal process of the R system is relatively diminished, and the activities of the three X-substances become more nearly proportional to the quantity of each free in the retina, as they are in the absence of light. On continuing the fixation with diminished illumination the R colour reasserts itself because, while the three X-substances continue to be used up in amounts proportional to the quantity of each present, *i.e.*, in about equal amounts, the R light continues to set free more R than G or B X-substance, and, therefore, presently restores the preponderance of the R X-substance.

In the case of reversal of colour by adding W light after fixation for sixty seconds (observation xxxiv.) we have the same factors to consider. The condition described above is produced by the fixation, namely, approximately equal amounts of R, G and B X-substances, fatigue of the second retinal process and of the cortex of the R system, and the

predominance of R in consciousness only just maintained by the greater reinforcement by the R light of the action of the R X-substance on the nerve-endings. The W light then brings an equal increment of stimulus to each of the three systems, and thereby the relative predominance of the R processes in the retina is diminished, and the activity of the R cortex yields to that of the G and B systems. The argument may appear clearer if put into a numerical form as follows: We will suppose that, the amounts of R, G and B X-substances being about equal, the R light is reinforcing their action on the nerve-endings of the three systems in the proportion of 40, 20 and 20 respectively; then suppose the W light increases the reinforcement of the action of each by 100 units, we then have 140 units of reinforcement of the action of the R X-substance and 120 of the G and of the B X-substances, the amounts of all three substances remaining about equal; if then the reinforcement of the action of the R X-substance, when twice as great as that of the G and B X-substances, was only just sufficient to maintain the predominance of the R-system, it will no longer suffice when only one-sixth greater.

On continuing the fixation of the mixed R and W light the R colour slowly returns, because with the brighter light the selectivity of its action on the second retinal process, to which the relative increase of the G and B X-substances was due, no longer exceeds the selectivity of its action on the first process in the same degree and may even be less; and the preponderance of the R X-substance is therefore restored.

In the reversal of colour on simple prolonged fixation the same factors are concerned, but the fatigue of the cortex plays the chief part, as is shown by the rapid changes and short duration of the phases of colour. We have again in the retina equal quantities of R, G and B X-substances, and greater fatigue of the second retinal process of the R system and of the R cortex, and the predominance of the R system maintained only by the greater reinforcement of the action of the R X-substance on the nerve-endings. Then, as fixation is further prolonged, the fatigue of the R cortex increases until the R cortex yields in the struggle with the B and G systems, which, though less intensely excited, have their cortical areas unfatigued—the B and G cortical areas spring into activity and inhibit the R cortex until, after a few seconds' rest, the latter is restored sufficiently to reassert its predominance over the former; and so on again and again as long as fixation is continued, the R continuing to predominate on the whole because of the greater reinforcement

of the second retinal process in the R system (observation xxx.).

We have already seen the explanation of the complementary coloured after-image of coloured light that is not very bright. Two points remain for consideration, the greater tendency of the after-image to be same-coloured after very short periods of fixation, and after fixation of very bright coloured light. The explanation of the former is obvious: During the short period of fixation the disproportionate accumulation of G and B X-substances has not time to occur, and the quantity of R X-substance will still predominate at the end of the short period of stimulation.

The explanation of the same-coloured after-image of very bright coloured light follows too from our premises. We have seen that, while at dull and medium intensities R light is more selective in its action on the second than on the first retinal process, this relation is reversed at higher intensities and the first, the setting-free process, exceeds the second, the using-up process, more and more the brighter the R light. Under the action of a R light of greater intensity than that at which the reversal of this relation occurs, the R X-substances must, then, accumulate more rapidly than the G and B X-substances and if the R light be bright enough the preponderance of the R X-substance over the G and B X-substances at the end of a period of stimulation will suffice to ensure the predominance of the activity of the R system for a time.

This result is favoured also by the fact that, on stimulation by very bright R light, the activity of the R cortex does not predominate over that of the B and the G cortex so markedly as on stimulation by less bright R light, as is shown by the less saturation of the R sensation excited by the very bright R light. The degree of the fatigue of the G and the B cortex must therefore be more nearly equal to that of the R cortex the brighter the R light fixated.

Here then we have the explanation of the apparent anomaly that, while a R light of medium brightness and good saturation is followed by a predominantly complementary coloured after-image, a very bright R light of lower saturation is followed by an after-image, in which R follows immediately and on the whole predominates over G and B. It is the explanation, too, of what appears almost paradoxical, namely, that even if the brightness of the R light be so increased that its redness is hardly perceptible, the after-image is much more R, *i.e.*, a much more saturated R, than the direct image itself.

There remain to be cleared up some points of minor importance in connexion with after-images.

In the after-images of coloured light of low intensity the colours are of low saturation, because in their case the W system plays a relatively large part, and the colour sensations are compounded with the W or grey sensation arising from its excitement; perhaps also because, the excitement of the colour-systems being of low degree, the antagonism between them is less keen and fusion of the colour-effects occurs more readily.

In the after-images of bright coloured lights the three primary colours appear bright and pure and tend to follow one another in a recurring cycle, as in the case of the after-image of bright W light, because the excitement of the systems being intense the antagonism between them is keen and the high degree of cortical fatigue is favourable to 'complete fading' of the sensation-element due to any one system.

In the case of any after-image in which the colour changes completely and suddenly, or with struggle, the change of colour does not correspond to changes in the retinal processes. It is rather that all three colour-systems are being continuously stimulated in the retina, and a delicate balance is set up between the activities of the contending cortical areas of the three systems. The balance being, by comparatively slight causes, inclined in favour of one system, that one predominates over and depresses the cortical activity of the other two; that system then tends to lose its predominance owing to the increasing fatigue of its cortex, and a very slight cause may determine its yielding to one or other of the other two systems. Of factors that tend to incline the balance in favour of the colours complementary to the light fixated, the presence of a sharp margin to the patch of light fixated (observation xlii.) and the projection of an after-image upon a W surface (observation xliii.) are important, as was shown above. The sharp margin favours the production of a bright halo around the after-image, and, in the case of a fixation of medium duration of light of medium intensity, the halo is of the colour of the light fixated, and, therefore, owing to the contrast-effect exerted by it, favours the predominance of the complementary colour in the after image.

In considering the effect of projection in favouring the appearance of B and G in the after-image of R light we must distinguish between after-images with and those without a halo. In the case of the latter, the effect seems to be

due to the fact that the second retinal process is more fatigued in the R system than in the other two, or in other words, the retinal nerve-endings of the R system are more fatigued and react less readily than those of the G and B systems to the reinforcement of the action of the X-substances by the light from the W surface. In the case of an after-image of R light having a R halo, or rather a halo due to diffused X-substances among which the R X-substance preponderates, projection still further favours the appearance of B and G in the after-image, because it reinforces the R halo and so increases its contrast-effect; and it reinforces the halo more than the after-image itself because in the area of the halo there are not only additional X-substances present, as in the area of the after-image, but the second retinal processes are not fatigued as in the after-image area, or but very slightly so. And we have seen (observation xlv.) that this reinforcement of the halo on projection may be so marked as to cause it to predominate very markedly over the after-image.

It is usual to class together the after-images of coloured light seen in the dark and those seen on projection on to a W surface, and to speak of them both as the expression of a state of adaptation of the retina. We should I think distinguish between the two classes of after-image, for although the same factors are concerned in both, the one factor, the presence of X-substances in the retina, is the essential feature of the former, and the other factor, the fatigue of the retinal nerve-endings, *i.e.* of the second retinal process, of one or other colour-system is an important and may be the sole factor in the latter class. The propriety of this distinction is illustrated by the following observation :—

Observation XLVI.—Direct sunlight transmitted through two sheets of G gelatine, one plate of ground-glass and a shaded disc of milk-glass gave a G shaded disc of fair brightness. Fixations of this disc, lasting ten, twenty, thirty and forty seconds, were followed in the dark by P after-images that lasted about thirty, thirty-five, forty and fifty seconds respectively. In each case, as soon as the after-image was no longer visible in the dark, the eyes were directed towards a surface of W blotting-paper of fair brightness, and in no case was any after-image then perceptible. Fixation of sixty seconds was followed in the dark by a P after-image that faded away completely after fifty seconds and could not be revived in the dark, but, on then directing the eyes to a sheet of W blotting-paper as before, a P disc was visible for forty seconds. In the same way fixations of ninety seconds, two

minutes and three and a half minutes were followed by P after-images that died away and could not be revived in the dark after about fifty seconds, but on turning the eyes to the W surface a P after-image was visible for seventy seconds, two minutes and seven minutes respectively.

With prolonged fixation, then, of coloured light the retinal nerve-endings (*i.e.*, the second retinal process) of the system of that colour become fatigued, and this fatigue passes off only very slowly and expresses itself as a complementary coloured after-image on turning the eyes to a W surface, long after the after-image, visible in the dark and due to the presence of free X-substances, has ceased to be visible. It is to this condition that the name 'adaptation' should be given, while the presence of X-substances determines the true after-image. I see no reason to reject the view that a gradual recovery from fatigue of this kind affecting the retinal nerve-endings of the W system is the chief factor in retinal adaptation for vision in dim light.

Section VII.—Conclusion.

The Seat of the After-image.

The question of the seat of the after-image has been much discussed, and although it is now, perhaps, generally said to be in the retina there are still some supporters of the view that it is in the brain. What has gone before will have made it clear that, as might be expected under these circumstances, both views are partially true. The material basis, the active chemical substances, on which the sensation ultimately depends, have their seat in the retina, while the predominance of one or other part of the after-image itself (in the sense in which the word is used in these pages) or its halo, and of one or other of the colour-systems is largely determined in the cortex.

Without attempting to discuss here the nature of these cortical events, which concern the physiology of attention rather than of vision, I will bring together here some facts that show the importance of the part played by the cortex: (1) The tendency for well-defined and homogeneous parts of a complex image, whether a direct image or an after-image, to undergo 'complete fading' and revival in consciousness as independent wholes, as illustrated by observations iii., iv. and xv.

(2) The fact that when two images are fixated succes-

sively and so as to fall partially upon the same area of one retina, each forms an after-image distinct and separate from that of the other, so that the two after-images may appear simultaneously or alternately in consciousness. This fact is illustrated by the following observation :—

Observation XLVII.—A plate of ground-glass was put over a rectangular hole, 20 mm. by 10 mm. in a sheet of cardboard. This, held up before a lamp flame, appears as a strip of bright W light on a dark ground. I held it so that the strip of light was vertical and fixated a point at the centre of the strip for five seconds, and then quickly turned it until the strip was horizontal and again fixated the point at its centre for five seconds. On then excluding all light the two positive after-images appeared successively, each complete and distinct from the other and appeared and disappeared, alternating with each other several times; then for some seconds both were visible together, forming a W cross, until one faded again and they again alternated.

(3) When an after-image is projected upon a not too bright surface it is not always modified at once by the effects of the light from this surface, but may maintain itself in consciousness unaltered for a certain length of time, as in the following case :—

Observation XLVIII.—I put in the dark cabinet between a plate of milk-glass and the photographic shutter a sheet of cardboard having a square hole in it about 8 cm. in width, so that on opening the shutter a bright W square appears. Over the milk-glass I pasted dark cloth, leaving uncovered a circular patch about 10 cm. in diameter and concentric with the square hole in the cardboard on the other side of the plate. Dim daylight illuminated the interior of the cabinet so that the uncovered part of the glass plate appeared as a disc of dull W on a dark ground. I opened the shutter and fixated the centre of the bright W square for ten seconds and then released the shutter, so abolishing the bright square, while keeping the eyes unmoved. Then although the image of the dull W disc was falling upon my retinæ, it did not affect consciousness at once, but for about five seconds I saw a dull W square, the after-image of the bright one, and then the image of the W disc appeared quite suddenly, popped up into consciousness as it were, and the after-image remained as a dimly defined area upon it.

These facts show that, apart from the after-effects in the retina, the fixation of any patch of light throws the cortical areas affected into a state of preparedness to function again, or to continue to function, in the same way as during the

action of the light, and that this tendency of the cortical areas may override and obscure changes initiated in the retina. They seem to me especially interesting because we seem to have in them the simplest possible manifestation of that which distinguishes the brain as an organ of reproduction of impressions from a mere photographic plate, namely, its tendency to reproduce separately the impressions made upon it at different moments of time; and also because we seem to have in them experimental proof of what on general grounds we are bound to assume, namely, that the same neural elements must take part in the storing of many different impressions, and that the essential fact of reproduction of an impression is that the neural elements, that were once thrown into a functioning group by the incidence of an external stimulus, tend to function again as the same group.

It is then not proper to say that an after-image has its seat either in the retina or in the brain; both retain an impress from the original stimulation, and though the persistence of the exciting substances in the retina is perhaps the more important element, yet the cortical impress plays a large part in determining the exact form in which the after-image shall appear.

The Compound Nature of the Sensation of Yellow.

To regard the Y sensation as compound in character is not of course essential to Young's theory, or rather, it is not essential to the theory that W results from psychical fusion of the colour-sensations. Müller, however, holding that his doctrine of colour-series proves the simplicity of the Y sensation, has advanced very convincing arguments against any form of the theory assuming the composition of W from four simple sensation-elements.[1] Müller's doctrine of colour-series certainly puts much more forcibly than had been done before the argument from immediate perception for the simplicity of the Y sensation. But the force of it seems to be completely shattered by the fact, pointed out by Mrs. Franklin,[2] that the R and the G, that must be selected as approximately pure or simple R and G by the use of the method of colour-series, are not a complementary pair. I have convinced myself of the truth of this in my own case by the following procedure:—

Observation XLIX.—I chose a sheet of gelatine that seemed, when held against a dense white fog, to be a pure G, and

[1] *Zeitsch. f. P. u. P. d. S.*, Bd. xiv., S. 327.
[2] *Psych. Rev.*, vol. viii.

with this I mixed, by the method of reflexion in a glass plate, a R of such a tone that it was possible to obtain a perfectly neutral mixture, the R light being also given by the light from the fog, transmitted through a sheet of R gelatine. I then included each of these in a colour-series reaching from B-G to P, the colours being given in all cases by the light from the white fog, transmitted through coloured gelatine. It was then quite clear that while the G was as nearly as possible a pure G, the R was not a pure R, but contained some B. And when I repeated the experiment in the reverse order and chose, from a series of G gelatines, a pure G and, from a series of R gelatines, a pure R (using in this case newly fallen snow as a background) and mixed the G and the R so chosen by reflexion in a glass-plate, the mixture appeared a yellow of good saturation.

This being the case, the method of colour-series does but furnish additional strength to the opinion, necessarily entertained by those who accept Young's theory, that it is impossible to determine from the character of a sensation that the physiological process underlying it is simple and that the sensation is not the result of psychical fusion of the effects on consciousness of two or more separate physiological processes. While admitting that Y does make the impression of simplicity in a greater degree than P or B-G, I think it is sufficiently proved that this impression is not a reliable ground of opinion by the fact that, of many persons competent to form an opinion, those who incline to the one theory usually adhere to the one view, and those who adopt the other theory to the contrary view of the matter. I can very distinctly remember that until I began to study physiology I regarded G as a mixture of B and Y, and felt that I could see both colours in any tone of G. It is true that this was probably due to my having been accustomed as a child to mix B and Y paints to make G; but this illustrates very well the psychological complexity of the factors that lead us to judge a colour tone to be simple or complex.

There seems to be no evidence for the simplicity of the physiological process underlying the Y sensation other than this vague and unreliable dictum of consciousness, whereas against it we have the following array of facts:—

(1) When I choose a pure R and a pure G by the method of colour-series and mix them the mixture appears Y (observation xlix.).

(2) If patches of R and of G light be thrown upon one area of one retina they may, under suitable conditions, show the phenomenon of struggle as well as of fusion, *i.e.*, at one

moment they may appear as Y, at another the R or the G may alone affect consciousness, thus proving that the actions of the R and G rays in the retina are not mutually antagonistic or destructive, but that they proceed side by side in the one area of the retina (observations xxvi., xxvii.).

(3) On fixation of a bright Y light it becomes after a few seconds a bright pure R or a bright pure G or shows struggle of R and G (observation xxxiii.).

(4) In the after-image of very bright light, whether W or Y or other coloured, Y never appears except as an incident in the struggle between R and G, just as P occurs as an incident in the struggle of R and B; *i.e.*, it appears only where G is struggling upon and yielding to R or R is struggling upon G and it never appears, as do R, G and B, forming one of the phases of constant colour of the recurring cycle R, G, B, R, G, B.

(5) On diminishing the illumination of a patch of Y after fixating it for thirty seconds or more, it usually becomes R unless the period of fixation has been considerably prolonged, when it usually becomes B.

(6) The after-image of bright Y light may be Y in the first phase, but this Y always resolves itself into G struggling upon R as in the case of an initial Y phase following bright W light. In the after-image of less bright Y light B usually appears, but R and G usually predominate.[1]

I will bring this paper to an end with a summary of the phenomena described in it, that the theory of Gegenfarben, whether in the form given it by Hering or in that given it by Müller, is incapable of accounting for :—

(1) The occurrence of the sense of absolute darkness or blackness in the absence of any stimulation by W light that could produce it by simultaneous or successive contrast (observation iii.).

(2) Simultaneously induced light appearing :—

(*a*) on a ground that has shown no previous contrast effect (observation xx.) ;

(*b*) almost or quite as bright as the inducing light (observation xx.) ;

(*c*) failing to appear on a ground on which a marked contrast is produced (observation xl.).

(3) Binocular contrast, whether of W or coloured light (section iii., p. 88).

[1] I refer here to an after-image observed under simplified conditions as described above, *i.e.*, one in which complication by halo and projection is avoided.

(4) Binocular fusion of complementary colours to give a W sensation.[1]

(5) Certain features of monocular contrast :—

(*a*) the total inhibition of a patch of colour by bright W light falling on an area of the retina at some distance from that affected by the coloured light (observation xxxix.);

(*b*) the inhibition of colour of low saturation by a W ground (observation xxiv.);

(*c*) the fact that contrast only appears as a modification of an existing sensation (observation xxxviii.).

(6) Positive after-images in general :—

(*a*) The phenomena of 'farbiges Abklingen' of the after-image of W light in particular, with its recurring cycle of phases of pure and highly saturated R, G and B (observations xxxv., xxxvi.);

(*b*) The fact that fixation of W light is invariably followed by an after-image brighter than the ground, if the conditions that lead to the production of a relatively bright halo are avoided (observations xvi., xvii., xviii.);

(*c*) The same-coloured initial phase of the after-image of all very bright coloured lights (observation xli.);

(*d*) The frequent appearance of a same-coloured phase in the after-image of less bright coloured lights (observation xli.).

(7) The variety of colours that may appear in the after-image of any light save the dullest that will give any after-image, *e.g.*, pure B phases in the after-image of R light (observation xli.).

(8) The array of facts indicating that the Y sensation is due to psychical fusion of R and G (p. 378).

(9) The reversal of the colour of a fixated patch by addition of W light (observation xxxiv.).

(10) The reversal of the colour of a patch of light during simple prolonged fixation (observations xxx., xxxi.).

(11) The appearance of colours of fair saturation during simple fixation of bright W light (observations xxix. and xlv.).

(12) The monocular struggle of complementary colours during which they fuse at moments to give W and at other moments appear separately in consciousness (observation xxviii.).

[1] (3) and (4) are only to be reconciled to the theory of 'Gegenfarben' by assuming, in the face of strong evidence to the contrary, identity of the cortical areas for the two eyes, as pointed out in section v.

(13) The fact that a W image, produced by monocular fusion of two complementary colours, may be followed by an after-image, the character of which proves that the rays of either colour have produced throughout the appropriate cerebro-retinal colour-systems their specific effects, and that, therefore, there has been no mutual destruction or interference of their physiological effects.

I have reserved the description of this last phenomenon because it will serve to clinch the argument against the theory of 'Gegenfarben'.

Observation L.—Two rectangular oblong holes were cut in a sheet of cardboard, as in the case of observation xxvii., the long axes of the two being at right angles to each

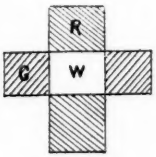

FIG. 22.

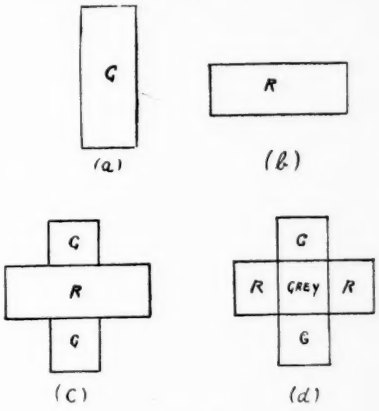

FIG. 23.

other. The one was covered with a sheet of R, the other with a sheet of G gelatine (both tinged with B), and a plate of ground-glass was put over both. This arrangement was fixed over the aperture of the dark cabinet so that the light from a bright sky, coming through the holes, caused them to appear as bright rectangles of G and R on a dark ground. The fixation of the G or the R rectangle alone was followed by a R or a G, *i.e.*, a complementary-coloured after-image in either case. By means of a glass plate, held at right angles to the plane of the cardboard, I then threw the reflected image of the one across the direct image of the other, and fixated a point at the centre of the combined image, maintaining my accommodation to a moderate degree. The square

formed by the coinciding parts of the two images then appeared W continuously throughout the fixation as in figure 22. On excluding all light from the eyes, after-images of the forms and colours denoted in figure 23 succeeded one another; the after-image of either of the coloured rectangles appeared at times complete in form and colour just as when that rectangle was alone fixated, and these two complete complementary-coloured after-images alternated several times with one another in consciousness. When they were present to consciousness simultaneously the common square area appeared sometimes a dull yellowish grey, sometimes in the colour of one of the after-images only, as in figure 23 (*c*).

This observation seems to prove incontestably that in the common square area, which in the direct image appeared W, the R light and the G light had produced each its own specific effects, exactly the same effects as when either works alone upon the retina, and that they had not in any sense or manner prevented each other from producing those effects. I have observed this alternation of the two complementary after-images many times after fixations of various durations.

There is then a very large number of striking phenomena of fundamental importance that cannot be accounted for by the theory of 'Gegenfarben,' and many of them are absolutely irreconcilable with any form of that theory.

Young's theory, on the other hand, if we incorporate with it the hypothesis of the separate W-exciting apparatus having its retinal seat in the rods, as urged by v. Kries, Rollet's theory of contrast and the theories of induction and after-images set forth above, explains fully all the phenomena described above; and, with the exception of certain observations of a complex character, very difficult to interpret, such as Müller's experiments on galvanic stimulation of the eyes and some of Prof. Sherrington's flicker experiments, I cannot discover any important fact connected with light- and colour-vision with which it is incompatible or that it fails to illumine.

V.—CRITICAL NOTICES.

ΑΡΙΣΤΟΤΕΛΟΥΣ ΠΕΡΙ ΨΥΧΗΣ. *Aristote: Traité de L'Ame*, traduit et annoté. Par G. RODIER, Maître de conférences à la faculté des lettres de l'Université de Bordeaux. I. (Texte et Traduction) pp. xvi. + 263. II. (Notes) pp. 585. Paris: Ernest Leroux, 1900.

ARISTOTLE's Treatise of the Soul may be regarded from points of view so divergent that what the would-be commentator is most sure of is that he must at least disappoint some types of requirement. Hence it tends to find a commentator but rarely. The available material, whether in the shape of better texts of the Greek paraphrases or in the more elusive form of programmes and degree-theses, articles, studies and notes, grows apace. But few are equally learned in Aristotelian and general philology, in the tradition of the Greek philosophical schools, in the history of mediæval interpretations of Aristotle, and in scientific psychology. And no one cares to meet a criticism of which the gist is that he is not omniscient. If we leave out of account editions like that of Torstrik, with its wholly admirable, if inconclusive, treatment of textual problems, and put out of court Edwin Wallace's able but misguided interpretation of the oracles in the interests of idealist edification, the fundamental edition of the *De Animâ* is, as M. Rodier says, still Trendelenburg's. Of this the groundwork was laid considerably more than half a century ago, while Belger's revision has for some time attained its majority. If Trendelenburg's learning had been equalled by his insight, he yet could not have availed himself of data which in his day did not exist.

The general difficulty of the conscientious annotator was not lessened by the emergence of the facts upon which Torstrik founded his textual theory. But the conservative reaction of Biehl towards the traditional text, and the extent to which Essen's rewriting of the treatise may be taken as evidence of the insolubility of the textual problem have recently freed students from the obsession of the philological sending. In all essentials the text commented by Alexander and Themistius is that which we have. It was this that exercised so extended an influence in the later middle ages. If there lies behind it something earlier and simpler, purer and shorter, this is at any rate irrecoverable.

It was to be expected that a commentator would arise on the

lines of the reaction, to make an attempt in the following of Trendelenburg rather than of Torstrik to bring to a focus the more recent literature dealing with the *De Animâ*, and to offer a revised, if possibly reactionary, interpretation.

Any considerable measure of success in his endeavour was certain to assure a welcome. M. Rodier's commentary is more than moderately successful. It is, we venture to think, indispensable. Where he is wrong, it is at any rate he himself who supplies most completely the materials for his discomfiture. Given his point of view, his notes mark a decisive advance on the other commentaries of the nineteenth century. His point of view is one which necessarily must have found an exponent. Equally it requires but one. His annotations, so far as they are bound up with his point of view, are unlikely to be superseded.

M. Rodier offers an ultra-conservative text and a defensive *apparatus criticus*. He supplies a translation directed to the giving of a sense based for the most part on a tradition elicited from the Greek commentators. His commentary is full and elaborate. If it owes most to Alexander and Simplicius, Themistius and Philoponus, it takes full cognisance not only of nineteenth century editors but of all that fugitive literature to which a *Jahresbericht* might call the periodic attention of a for the most part unheeding public.

M. Rodier gives no introductory essays. There is no appraisement of Aristotle's doctrines from the standpoint of newer psychology. There is no attempt to decide for empiricism or apriorism. There is no arbitrating between opposed views as to the nature of the imperishable *νοῦς*, no holding of the scales for Alexander, Averrhoes, and St. Thomas. *Nous n'avons pas abordé ces questions.* "To interpret the treatise otherwise than in its detail and to resolve in a determinate sense problems on which Aristotle himself has neglected, of set purpose perhaps, to pronounce himself in a precise and definite manner, it would have been necessary to give somewhat arbitrarily a preference to certain tendencies and texts at the expense of certain others, and to disfigure somewhat a work whose physiognomy it was intended to reproduce exactly." It is exegesis of the *De Animâ* that M. Rodier offers, and nothing else. His intention he sums up by styling his volumes a *traduction justifiée.*

M. Rodier has chosen for his motto that passage in Plato's *Cratylus* where after the licence of free conjecture Socrates pulls up himself and his companions with a condemnation of the easy principle of adding a letter here and taking one away there at will, and calls for an arbiter and a standard. M. Rodier is against Essen, and on the whole against Torstrik, though not against the facts adduced by the latter, which he acknowledges by printing the principal variants of E in book ii. as an appendix. He will not admit a doublet unless clear necessity is shown. He follows Biehl upon the whole, with a rejection of most of that editor's

emendations. It is indeed worth while to see for once whether the text avouched by manuscript authority will give a sense. A favourable specimen of M. Rodier's attempt is book iii., chapter vi., where, at the expense of a mistranslation of ἤ and a slight emen lation of the text on his own account, he finds himself able to dispense with a variety of conjectures, including a quite certain one of Prof. Bywater's.

M. Rodier's critical *apparatus* is derived from Biehl. He has himself gleaned something from a fresh collation of E. The use made in this *apparatus* of the Greek paraphrases for purposes of text involves some neglect of proper canons. Quotations other than the shortest, whether as headlines or embedded in the metaphrase, have seldom escaped revision, and have the value of quite la e manuscripts only. Inferred readings are often of far greater value, and should always be distinguished, though they rarely prove a point to demonstration. The textual evidence of the Greek commentators should be completely harvested or not at all. Taking haphazard iii., 4 with Themistius' paraphrase, our record against M. Rodier is as follows: in 429 *a* 14 Themistius, as well as the commentators cited, reads τι. In 15 Themistius is quoted for ἄρα: he actually says τοίνυν in one place, and in another while using ἄρα he adds at the end of the clause τὸ νοητικόν. In 20, if Themistius' version is to be followed, as it is by M. Rodier, we must either punctuate a parenthesis above or emend the text. In 429 *b* 1 one manuscript of Themistius reads ἤ before τῶν μικρῶν ψόφων. In 3 Themistius omits τι twice, though Heinze in one place supplies it from the text of Aristotle! In 8 καὶ τότε is inferred from Themistius' καὶ τηνικαῦτα. In 23 the *non legisse videtur Them.* is too strong. It is simply indeterminate.

M. Rodier's translation is of the essence of his scheme. He admits to having sacrificed deliberately all attempt at grace in his desire to keep close to the thought of Aristotle. He admits, what is more serious, the sacrifice of *correction grammaticale.* The latter jettison is made under the assumption that it implies *outrecuidance* to maintain that a Themistius or an Alexander knew less well than we do the language or doctrine of Aristotle. And yet the modern Englishman who should read with interest and expound with intelligence his Chaucer or Beowulf might yet bow to the German expert in oldest English and kindred speeches. There is always the possibility too that your Greek commentator felt the difficulty, knew that he was explaining against the grammar, and yet was reduced to it like the poor modern. The translation designed on these lines is gruesome enough. The use of brackets for added words is somewhat haphazard. Where the words are necessary to the sense the brackets are superfluous. Where the words are not necessary, it is the words that are superfluous.

As an example of bad translation we may cite the last clause of i., 1. *Or nous disions que les états de l'âme* [*ne peuvent*] *pas non plus* [*être regardés*] *comme séparables de la matière physique*

des animaux et que, par conséquent, c'est en tant que leur corps ou leur matière possédent telles qualités, que le courage ou la crainte se réalisent en eux, et qu'il n'en est pas [*pour ces états,*] *comme pour la ligne et la surface.* Or 427 *a* 14. M. Rodier is not sound as to the use of the article, 409 *b* 1, 414 *a* 17, 418 *b* 28. He occasionally blunders: στρατηγεῖν is not *porter les armes ;* τε cannot give *par suite,* 424 *b* 26. He is sometimes misled by the Greek paraphrases, as *e.g.* by Philoponus to translate τὰ ἀκολοθοῦντα καὶ κοινὰ *les sensibles derivés et communs.* M. Rodier sometimes translates against his own views as expressed in a note, 427 *a* 22, 414 *b* 9. In 431 *a* 29 he translates the reading he rejects. We cannot accept τόδε τι *une forme substantielle,* or εὐθύνας δεδωκυῖα *en guise de châtiment,* despite of notes justificatory. Nor λόγος *pensée discursive,* when it is in the context said to include definitions as well as demonstrations. Nevertheless, though M. Rodier's translation will not stand beside that of Bonitz for the *Metaphysics,* it on the whole serves its purpose. We know how M. Rodier takes every word. Entire chapters are excellently done. In rejecting emendations based on the logic of the argument M. Rodier has so handicapped himself that, taking this with his overestimate of the Greek commentators, it is more wonderful that he has succeeded so far as he has done than that he has slipped once and again. Only we take it that his commentary justifies his translation in a different sense to that which he supposes.

The commentary is excellent. It gives too much weight to the consensus of the Greek commentators. In default of a definite passage in Aristotle to be adduced in arrest of judgment, it is assumed to prove a tradition of the school. But the later did use and borrow from the earlier, and the last—Sophonias—is nearer in date to M. Rodier than to Alexander. Except as regards the *Timæus* the Platonic antecedents of the *De Animâ* are perhaps underestimated. On the other hand M. Rodier makes admirable use of Aristotle himself as his own commentator, in particular of the *Physics.* He can bring in a decisive quotation from Met. Δ 6, to settle the meaning of the metaphor of the bent line and the straight (iii., 4) once and for all. He is far fuller than his predecessors on the 'common sensibles' and on the relation of 'common' to 'primary and undifferentiated,' κοινὸν to πρῶτον. Of what M. Rodier can do with the Greek commentaries a favourable specimen occurs i., 1, 402 *b* 7, where, resting on Alexander, he gives a convincing interpretation of the famous statement that 'the universal animal is either nothing or subsequent to man and horse'. We are dealing with the soul which has no κοινὸς λόγος, since there are stages ἐφεξῆς from the nutritive up to the thinking soul, each higher requiring the lower as indispensable condition, but not conversely. Now the soul is not a genus of which the human or rational soul is one species and the plant's life of nutrition another, not yet is it merely used equivo-

cally of the plant, soul and 'noetic consciousness'. It is as if animal species were grouped serially on a scale. Then ζῷον which, as it is, is a genus and logically prior to the species in which it is determined to particular existence, would be either an equivocal term and in reality nothing, or it would be subsequent to the determinate groups. Soul is subsequent as animal would be on this hypothesis. Thus disappears one of the stock quotations to prove Aristotle's nominalism. In notes like this M. Rodier patiently unravels a meaning which was practically lost. In others the cumulative effect of passages singly inconclusive determines the result. Everywhere one is certain of having the data presented fully, and of a sober exercise of judgment in summing up.

M. Rodier has no dogmas to find support for, except the prerogative authority of the Greek commentators. He is of the true temper for successful exegesis. The theory of development in Aristotle's doctrine of perception from the formula which makes it receptive of form without matter to that of δύναμις and ἐνεργεία has no attraction for one who realises with M. Rodier that the δυνάμει αἰσθητόν is ἐνεργείᾳ τόδε τι. The always truthfulness of our perceptions of the 'proper sensibles' is not perverted to mean that in subjective reference every experience is real, while error is wrong reference to objective reality, but gets its right meaning and the right explanation of the qualification of the 'always'. There is no modernisation. There is no attempt at 'sympathetic development'. What Aristotle ought to have meant is never alleged in order to be enforced as what he must have meant. It is because of this that M. Rodier's account of sense-perception and again of νοῦς is such a model of exegesis in detail—and so disappointing to all who are sure that Aristotle could not have left a dualism untranscended, and who are clear that the νοῦς ποιητικός which they do not find in Aristotle, must mean 'the universal consciousness' or what not. M. Rodier's notes on νοῦς —and in particular the central note—can only leave the student less certain rather than more certain, but this only because the passages are grouped and commented and allowed to communicate their own ambiguities and difficulties. And to think that had there been but one passage, and the Greek commentators agreed about it, M. Rodier's canon as to the tradition of the school would have compelled him to a dogmatic solution!

In the historical portions of book i. M. Rodier has made good use of Zeller and of Martin's elucidations of the *Timæus*. Elsewhere he seems to have learnt most from Bonitz, whose *Metaphysics* seem to have been his model, as the same writer's contributions to the interpretation of the *De Animâ* both in special studies and in the *index Aristotelicus* are his most carefully sifted material. And Trendelenburg is 'fundamental'. This implies a limitation to certain aspects only of what is of interest in regard to the *De Animâ*. We need notes which shall do as

much for the Latin commentators as M. Rodier does for the Greek. They, too, represent 'the tradition of a school' (though doubtless not *the* school) which is well worth preserving. We want a commentary that shall not be afraid to say something of Averrhoes. We should be glad of a translation and commentary such as Dr. Ogle has given of the *De Partibus Animalium* for another side of the subject. A historian of philosophy who thought it worth while to explain clearly and in brief how τὸ δυνάμει αἰσθητὸν got transmuted into 'permanent possibility of sensation,' or how αἴσθησις κατὰ συμβεβηκός in one of its senses helped out the construction of Berkeley's Theory of Vision, would also have a lesson for us. But before all these comes exegesis of the text as it stands—as if it were verbally inspired. In this M. Rodier approaches to the ideal far more nearly than any other modern editor, the 'fundamental' Trendelenburg not excepted.

M. Rodier is not free from mistakes. His use of the epithet 'practical,' for example, in reference to the νοῦς of Anaxagoras (p. 52) is singularly unfortunate. He, to our thinking, somewhat confuses the doctrine of the 'common sensibles' as presented in iii., 1, not only by his perverse rendering of καὶ τοῖς ἰδίοις but also by taking the movement by which we perceive them as the movement which they produce in us. And these are but instances. If, however, the notes could shake themselves free of the insidious influence of his fatal canon as to 'grammatical correctness'; if they could be somewhat condensed, so that obvious translations were not thought to need the support of quotations from Philoponus—'the bore,' or even from Sophonias; if the Greek commentator were reduced to his proper perspective, and if copious indices were supplied to notes as well as to text, M. Rodier's second edition would take a high place, as this already must in a less degree, among the better contributions to Aristotelian exegesis, fit though few.

M. Rodier's printer suffers from a distressing malady which has led to the inversion of τ and θ at least seven times in the one word συνθετὸς.

HERBERT W. BLUNT.

Experimentelle Beiträge zur Lehre vom Gedächtniss. Von G. E. MÜLLER and A. PILZECKER.

THIS volume of three hundred pages appears as the first 'Ergänzungsband' of the *Zeitschrift für Psychologie und Physiologie der Sinnesorgane.* The authors report and discuss the results of work carried on in the psychological institute at Göttingen to supplement and extend the earlier work of Prof. Müller and Dr. Schumann, published in the sixth volume of the same journal under the title 'Experimentelle Beiträge zur Untersuchung des

Gedächtnisses'. It will be remembered that that work was in turn a carrying farther of the method of Prof. Ebbinghaus, by the help of various refinements of procedure, especially a more careful method of building the rows of nonsense syllables and the presentation of them to the subject successively and with great regularity by means of a horizontal revolving cylinder driven by accurately regulated clockwork. In that earlier work the method chiefly used was to determine how many repetitions of the reading of a row of twelve syllables was necessary to the learning of it, the syllables being either new or in some degree familiar either in the same or other orders of succession and association.

In this recent work, which was extended over a period of eight years, some half-dozen subjects, besides the authors, took part. Rows of nonsense syllables, prepared and presented with the same care and elaborate precautions as in the earlier work, were read aloud by the subject. A row was not, as in the earlier work, read again and again until the subject could repeat it without hitch, but each row, consisting in most cases of eight syllables, was simply read a certain number of times, with trochaic rhythm, *i.e.*, the first, third, fifth and seventh syllables being accented. After a given interval each accented syllable was again presented to the subject singly, and he was instructed to speak as rapidly as possible the succeeding syllable of the row; the association between the two syllables of each pair in this order was called the intentional association, while any association formed between the accented syllable and any other of the row than its immediate successor was called a 'Neben-association'. This, which the authors designate as the procedure by hits (*Treffer-verfahren*), was the basis of the many series of experiments recorded. The presentation of the individual syllables was so arranged that the time intervening between the moment at which the written syllable became visible to the subject and the moment at which he began to speak the associated syllable could be accurately measured in every case. The apparatus for this purpose was somewhat complicated, but consisted essentially in a small horizontal cylinder on which the syllables were written in order, a falling screen with a slot through which one syllable became visible on the falling of the screen, an electric circuit passing through a Hipp chronoscope and so arranged as to be opened by the fall of the screen and closed again by a lip-key released by the subject in beginning to speak. If no syllable came to the mind of the subject with a feeling of rightness he, according to his instructions, spoke the word 'Nichts' as soon as he felt that a further search for the right syllable was useless, and this time was also measured. The results of a series of such experiments were then tabulated as the number of right and false hits and of null-cases, and the average time was given for each of these.

The first subject investigated was the relation of the reproduction-times to the strength of the associations, the latter being

varied by varying the number of the readings of the syllable-row from three to eighteen, and the intervals between the reading of the rows and the presentation of the single syllables from two minutes to twenty-four hours. The most interesting of the results yielded by analysis of the figures were as follows: The stronger associations, which give a larger percentage of right hits and smaller percentage of false hits and null-cases, give a shorter average reproduction-time; the associations of shorter reproduction-time remained effective (*überwerthig*) for longer periods than those of longer reproduction-time; older associations that give the same percentage of hits as newer ones yet require a longer reproduction-time.

The very interesting third chapter deals with what the authors call 'Perseverations-tendenz'. By this term, borrowed from mental pathology, they denote the tendency of syllables once read to rise freely to consciousness without any apparent reproducing association. In some subjects this tendency was manifested very clearly in the intervals between reading the row of syllables and the experiments on their reproduction, and some, although instructed not to think of the syllables during this time, could not prevent their rising to consciousness even when they occupied themselves with some light mental work. In other subjects this tendency was very much slighter. The tendency, if strong at first, declines very rapidly in the course of the first few minutes. This was found to account for the large proportion of syllables which were brought up by 'Neben-associationen,' when the reproduction took place within a few minutes of the reading of a row, for, owing to the strong tendency of the various syllables to rise to consciousness, these feeble associations were of effective strength during these first few minutes. The authors point out the similarity between this tendency and (1) the working of the sensory-memory, the repetition-sensations occasionally experienced after long occupation with some one kind of sensory impression; (2) hallucinations of sense, (3) the motor-disposition (*Motorische Einstellung*), (4) the persistent recurrence of melodies, (5) the pathological recurrence of words in unsuitable connexions. In Prof. Müller this tendency was found to be very strong while the strength of the associations between syllables was in him comparatively slight; in the case of the professor's wife the converse was found to be true, the associations were strong and the 'Perseverations-tendenz' feeble. The working of these two types of memory in the daily course of life is displayed in an interesting manner, and it is pointed out how, while the mind with strong associative power is suited to practical occupations, such as administrative work, the mind with strong 'Perseverations-tendenz' is best suited for the working out of theoretical problems, this tendency being the basis of our capacity for the pursuit of ideal ends.

Chapter iv. treats of the interaction of simultaneously active

reproduction-tendencies. While consciousness can entertain only one image (in the case in hand one syllable) at one time, yet any given image (syllable) may be associated with several others. What then are the laws according to which such contending reproduction-tendencies work? The authors point out that two facts only in this most important field of inquiry are established: (1) two feeble associations may supplement one another, thus if *a* and *b* be both associated with *c*, but either one too feebly to reproduce *c* when presented alone, then if *a* and *b* be presented successively *c* may be reproduced: (2) Müller and Schumann had shown in the work mentioned above that a syllable already associated with another is less easily associated with a third than is a new syllable. For the further investigation of these laws many series of experiments were made, of which the type may be represented as follows, in a form much simplified by leaving aside the most careful precautions for securing truly comparable effects; —let each letter represent a syllable, then two rows of syllables are constructed thus:—

a-b, c-d, e-f, g-h.
i-j, c-k, l-m, g-n.

The syllables *c* and *g* occur as accented syllables in both rows. The former row is read twelve times, then the latter row is read three times, and then the accented syllables of the former row *a*, *c*, *e* and *g* are presented in turn to the subject. It then appears that the syllables *c* and *g* give a smaller percentage of hits than *a* and *e* and their average reproduction-time is longer, so that the feeble associations formed by *c* and *g* with *k* and *n* respectively in the reading of the second row three times seem to diminish the effectiveness of their stronger first-formed associations with *d* and *h*. Such a hindering effect the authors call 'effektuelle Hemmung'.

By ingenious modifications of experiments of this type, all carried out with extreme precautions for the isolation of the influence of the factor to be studied, the authors were able to distinguish, besides the 'effektuelle Hemmung' (the mutual interference of two reproduction-tendencies), a 'generative Hemmung,' a hindrance to the formation of a new association exerted by one already formed; thus if *b* is associated with *a* then *a* cannot form a new association with *c* so readily as a new unknown syllable does. The 'generative Hemmung' can only be distinguished from the 'effektuelle Hemmung' by introspection during the reading of the syllables. Another aspect of the factor that makes itself felt as the 'generative Hemmung' is the 'associative Mit-erregung'; — when an association has been formed between two syllables, *a* and *b*, and the syllables *a-c* then occur in a syllable row it is found that on the reading of this row the *a* frequently recalls *b* to consciousness and so refreshes the association *a-b*, and evidence of this effect is found in the numerical results even when *b* does not rise to consciousness; so it seems that *a* may in some way set the nervous tract concerned in the

production of *b* into a state of readiness, or subliminal excitement, that strengthens the association *a-b* without actually recalling *b* to consciousness. We must suppose that, in such a case when *a* is read in the syllable row—*a-c*—part of the energy of the excitement of the nervous tract corresponding to *a*, which, if *a* were an altogether new syllable, would be devoted to establishing an open road from tract *a* to tract *c*, is diverted to and used up in the re-excitement of the tract *b* or, at least, in the excitement of the tissue joining tract *a* to tract *b*. The 'associative Mit-erregung' obviously tends to obscure the working of the 'effektuelle Hemmung,' but as the conditions of their effectiveness are affected differently by the time-intervals between the establishment of the associations and the reproduction experiments, it was possible to separate the two factors by suitable variations of the experimental constellations.

Another interesting effect is the 'associative Misch-erregung,' the concurrence of two syllables to form a third, each supplying a part of it. This might be effected in two ways, either by a struggle between two syllables *b* and *c* that are both strongly associated with the arousing syllable *a*, *i.e.*, by a struggle between two strong reproduction-tendencies exerted by *a*, analogous to the struggle between the two dissimilar visual fields; or through one reproduction-tendency, in itself incapable of reproducing the complete syllable, being supplemented by a still feebler reproduction-tendency. The authors conclude that the latter is the usual form of the mixed reproduction, basing this opinion on various grounds, but chiefly on the observation that these mixed syllables are usually given by an intentional association and a 'Neben-association' rather than by two intentional associations, *i.e.*, by a strong and a weak association rather than by two equally strong associations.

The authors point out that some of their results can only be explained by the hypothesis that every memory-image that has any tendency to rise to consciousness, whether through its own 'Perseverations-tendenz' or through association, hinders to some extent the formation and the effectiveness when formed of new associations. Both Ebbinghaus and Müller and Schumann had shown that with increase of the length of the syllable-row the number of readings necessary to the learning of it increases very rapidly; a similar effect appears with the procedure by hits, and the authors conclude that in this case it can only be due to mutual inhibitory effects of the numerous reproduction-tendencies. The thought suggests itself that the effect may be due in part to that limitation of the capacity for attention invoked by Müller and Schumann to explain the fact that concentration of attention on one part of a syllable-row necessarily results in a diminution of the attention given to the remaining parts.

Chapter v. establishes the 'rückwirkende Hemmung,' a weakening effect exerted on recently formed associations by intellectual

application (in the cases dealt with, the learning of new syllable rows and the close examination and description of a landscape picture for a few minutes immediately after reading the syllable-row). The authors conclude that after the reading of a syllable-row a certain physiological activity persists for some minutes in the nervous tracts concerned, and that this, which is the basis of the 'Perseverations-tendenz,' increases the fixity of the associations between the syllables and is inhibited by any further mental work. This view is borne out by the fact that the 'Perseverations-tendenz' and the 'rückwirkende Hemmung' both decline very rapidly in the first few minutes, so that after ten minutes they are usually hardly appreciable. This demonstration of the 'rückwirkende Hemmung' throws light upon, we might almost say explains, certain recorded cases in which a severe blow on the head has wiped out completely the memory of immediately preceding events. It throws light too on the fact, noted by some persons, that what is learnt immediately before falling asleep is often remembered with exceptional accuracy.

Chapter vi. establishes the tendency of the last member of a complex to reproduce the first rather than intermediate elements, and the bearing of this upon verse is pointed out.

Chapter vii. investigates critically the false syllables spoken and establishes among other interesting results the following: each unaccented syllable tends strongly to reproduce its accented predecessor; each syllable tends to reproduce the next but one with considerable strength, and this is true in a greater degree of the accented than of the unaccented syllables; no evidence of mediate association could be found, but the conditions were not favourable to its appearance. The last chapter shows, among other things, how the type of memory of the subject may be inferred from the experimental results, and how this is not constantly visual, auditory or kinæsthetic in any one subject but may be mixed and may vary from time to time in a subject during the course of experiments. It shows also how different letters are not equally easily retained and treats of other peculiarities of the material and the subjects of the experiments.

This so fragmentary attempt to summarise the volume can give neither an adequate impression of its manifold interest nor an insight into the truly admirable thoroughness and ingenuity of the methods employed. But enough has been said to show that the investigations throw a flood of new light upon the physiological processes that underlie our higher mental processes, and that they suggest at once new problems and possibilities of solving them. It could be wished that the authors had taken this opportunity to discuss more intimately the physiological nature of those effects which are the basis of memory and association and the processes underlying hindrance ('Hemmung') and psychical inhibition in general, in the light of the new evidence obtained. For there can be no one more eminently qualified for

this task than Prof. Müller. But when so much has been given it is ungracious to ask for more. With the earlier paper by Müller and Schumann, this work seems to the present reviewer to be a triumphant demonstration of the value of the application of experimental methods to the investigation of our higher mental processes, and it is undoubtedly a model of close reasoning and ingenious, accurate and bold experiment.

W. McDougall.

Animal Behaviour. By C. Lloyd Morgan, F.R.S. London: Edward Arnold, 1900.

Originally intended as a revision of *Animal Life and Intelligence*, this work grew under the author's hands into a new book. Hence the title, *Animal Behaviour*, which, already employed by Prof. Whitman in the *Biological Lectures* of 1899, is happily free from any implications of the presence or absence of consciousness as a factor at any given stage of animal life, and might well take the place of more equivocal terms commonly in use. The aim of the work, nowhere definitely stated, one may infer to be threefold: to characterise the chief types of animal behaviour or reactions to surrounding conditions, to offer a criterion for the presence of effective or guiding consciousness behind any particular mode of behaviour, and finally to discuss the limits of conscious evolution in the animal world below man: incidentally also the inheritance of acquired characters, and the relation of organic to natural selection are topics occupying a considerable space.

More than any other English writer Mr. Lloyd Morgan possesses the qualifications which Groos demands in the animal psychologist—uniting "with a thorough training in physiology, psychology, and biology the experience of a traveller," etc., and lately he has shown himself to be the *sine quâ non*, "a student of æsthetics". A lover of animals, he has the rare virtue of self-restraint in describing their mental attainments.

As is well known, Mr. Morgan has finally taken up a sceptical attitude in reference to the inheritance of acquired characters, and this work may be regarded as a successful attempt to describe and account for the evolution of animal behaviour without its aid. Inherited are (*a*) "those relatively definite modes of behaviour which fit the animal to deal at once, on their first occurrence, with certain essential or frequently recurring conditions in the environment," and (*b*) "the power of dealing with special circumstances as they arise in the course of a varied life". Acquired on the other hand are the modifications due to the individual's efforts to adapt itself to the environment in which it is placed. Instead of the inheritance of modifications we have the selection

of "coincident" variations, the survival of which is favoured by the modifications that coincide in direction (p. 40 ff.). The weak point in the theory seems to lie in the second inherited factor, the "innate plasticity," the "legacy which may be drawn upon for any purpose as occasion may demand" (p. 41), "the reserve fund of intelligent accommodation," "inherited ability to meet specially difficult circumstances as they arise" (p. 176). It is difficult to understand how an indefinite faculty of this kind can be inherited, or how to picture to ourselves the structural basis. Mr. Morgan himself supplies the corrective—"Individual behaviour in its first intent, is a biological legacy with ends predetermined through heredity. . . . But the attainment of ends thus already predetermined has feeling-tone, both as process and in its resulting consciousness, and this feeling-tone serves to modify, through the situation it introduces, future behaviour." "Pleasure is not for them (animals) a motive of conduct, though nice objects, as such, are attractive, and through them impulse acquires direction and force" (pp. 283-284). Inherited then is the attraction by nice objects, and repulsion by the reverse, what objects shall be nice being also congenitally determined, but the associations (*e.g.*) between the taste and the sight of objects have in all cases to be acquired. Readiness in forming associations, firmness in retaining them, promptness in acting upon them—all these are subjects of organic variation, on which natural selection may play, and for which on the other hand a structural basis can easily be imagined. Perhaps this is only a restatement of Mr. Morgan's own view, but certainly the idea of an innate plasticity is left vague: it is applied for example to lower organic forms, where no learning by experience is admitted, and where it seems to mean variation simply.

Without committing himself to a definite statement, Mr. Morgan suggests that Consciousness as we know it—"Consentience"—may have been preceded by a stage which he names "sentience" or non-effective consciousness. "*Ex nihilo nihil fit*, and since consciousness must, on this principle, be developed from something, it is reasonable to assume that this something is pre-existing sentience" (p. 61). Sentience is consciousness that merely accompanies reactions, but does not control or guide them: it is passive, momentary, discontinuous, as compared with the active continuous consciousness that may have been developed from it (Michael Foster). Admittedly hypothetical, its presence cannot be ascertained by any known means, but, if it exists, it probably represents the kind of conscious life enjoyed by plants and by the lowest animal forms,—protozoa. The consciousness which occurs is merely a "dim sentience," and has no directive influence on the nature of the organic response called forth. It also, if any, is the consciousness present in correlation with the reflexes of the higher animals during the early stages of growth. Just how ineffective passes into effective consciousness is hardly clear: in one passage (p. 295) it is said that in the former "the process

of conscious coalescence has not begun or has not been carried far enough". Elsewhere the guiding consciousness is said to arise in connexion with certain centres of control in the nervous system, to stand apart from what it guides as these centres do from the lower centres of direct action (pp. 43, 331). The consciousness that leads to guidance of action arises from the results of *previous* behaviour: but again consciousness is correlated never with efferent but always with afferent impulses or their representations (p. 45). After all then is the difference between Sentience and Consentience more than one between simple and complex, and if so, can a difference of complexity cause a difference so wide as that between merely accompanying and controlling consciousness? "Mere sentience, if it exists, has no power of guidance over organic behaviour, but consciousness, when it emerges, is a concomitant of nervous processes which determine the nature and direction of such nerve changes as are antecedents of intelligent behaviour" (p. 331). But sentience is also the accompaniment of a nerve process, and nerve process cannot, we may assume, occur without determining behaviour: the only difference in the case of sentience is that the nerve process does not produce behaviour directly, but through the medium of other nerve processes, *i.e.*, the whole central process is more complex. It seems, therefore, that only two alternatives are open, either to take all consciousness, including sentience, as alike effective (or ineffective) in determining behaviour, or to suppose that consciousness only begins with types of behaviour that show adaptation on the ground of experience: the experience itself producing the adaptation, through association, and being therefore an effective consciousness. The latter appears the more satisfactory hypothesis; it is difficult to understand the *ex nihilo nihil fit* argument (p. 61), for it holds of sentience as well as of consentience, and a consistent monist must follow Haeckel in supposing a form of consciousness (?) to accompany the movement of the atom. Metaphysics apart, there is no serious objection to postulating two seemingly abrupt transitions in nature, since we must in any case postulate one. The problem would then arise,—at what point in the evolution of organisms does consciousness first appear?—the problem which Bethe, *e.g.*, touches in trying to reduce the behaviour of ants and bees to the reflex type—*i.e.*, to a stage prior to the appearance of any conscious process.

One of the most valuable contributions of this work to animal psychology is its view of the relation of instinct and intelligence in the individual mental development. Experience is not inherited, but only the conditions under which experience may be acquired, *viz.*, the instinctive reactions to stereotyped surroundings. For example, fear of any particular animal, such as man, is never innate, but timidity, the tendency to run, hide or crouch, is so, and forms the basis on which particular fears are built up (p. 48). In instinct itself what is inherited is not knowledge of any kind

but simply a muscular co-ordination, set up by a certain stimulus: on seeing a worm the young bird pecks at it not because it knows what pecking means, or its use, the action is unconscious, at the same time it derives sensations, both from the act and from its result, by which its future behaviour may be modified. Only the first exercise of an instinctive act is independent of experience (p. 105): there is thus a continual interaction between instinct and intelligence, in spite of their difference of origin: but the more fixed the former, by inheritance or habit, the less capable is it of intelligent modification (p. 171). Far from finding the world a sensation-chaos from which it has to select the data for its experience, under the guidance of chance, the young consciousness enters into what is already a "going concern". There is a "thrusting forward of certain modes of behaviour by the conditions of organic life" (p. 53), these are impressed on the animal's consciousness and constitute its first centres of interest. The conscious situation, the meaning of objects develops under experience, and the responses become correspondingly more complex. "Experience grows by the coalescence of successive increments, and each increment modifies the situation which takes effect on the *succeeding* phases of behaviour" (pp. 46, 47).

A distinction which occupies a foremost place in *Animal Behaviour*, and for which, as well as against which, much might be said, is that between intelligent and rational action. "We shall reserve the term *rational* for the conduct which is guided in accordance with an ideal scheme or deliberate plan of action, while for behaviour, to the guidance of which no such reflexion and deliberation seems to have contributed, we shall reserve the term *intelligent*" (p. 59). The stages of consciousness to which the types of action correspond are practically the perceptual and ideational of Dr. Stout. In the one type we have behaviour arising from impulse, in the other conduct arising from motives. In an intelligent being impressions are linked together by bonds of association, combining and coalescing to constitute a conscious situation (which has "meaning" for the animal), effective under the guiding influence of pleasure and pain—at its highest mere picture thinking, in which the outline, the emphasis, the colouring, and the succession of the pictures are due to the passive impress of experience. The seemingly rational actions of animals are almost invariably, as Mr. Morgan holds, products of this form of consciousness, the "trial and error" type. He does not accept the suggestion of Thorndike that the actions even of higher animals are accompanied by no representative images of past experience, that association is between percept and impulse to act, not between ideas or ideal elements. Mr. Morgan gives also rather scant consideration to Bethe's work, to which reference has been made. But certainly the Peckhams' locality-studies on the solitary wasps seem to settle the question in favour of "intelligence" as against "reflex" behaviour. In contrast with the merely intelli-

gent, the rational being thinks by way of general or abstract rules rather than by concrete examples. Those who have read Mr. Morgan's other works will remember that the difference between the lower and the higher consciousness is made to depend on the way in which the forms of connexion, the relational elements within the pictures are brought into the focus of attention. The generic images of the intelligent mind are the "embryonic structures from which, under the quickening influence of a rational purpose, abstract and general ideas may be evolved" (p. 166). Only one is apt to feel that here, in the rational purpose, "the intentional purpose directed to the special end of isolating the one" (abstract ideas) and "classifying the other" (general ideas) is a difference in *kind* introduced. How can a being which starts from the level of picture thinking conceive the purpose of isolating an idea? On the other hand, if there is no difference in kind, there can be no hard and fast line drawn in the animal world between rationals and non-rationals, and indeed Mr. Morgan admits in many animals an approximation to reason—in the cat, for example, which punishes it kitten for uncleanliness.

Having established the three phases of conscious behaviour—instinctive, intelligent, rational—the author proceeds to show how in all the more general modes of reaction to environment these phases reappear. Play, imitation, tradition, communication, all these are at first instinctive, are pursued, secondly, on account of the pleasure experience shows to be derived from them, finally are chosen as means to ulterior ends. The imitation of each other by chicks, for example, is imitation "in its effects, not in its purpose," while the imitation which Thorndike denies of animals is precisely of the rational or reflective type, involving the perception of relations otherwise quite outside the animal's experience. In interpreting those actions of animals which suggest the higher ethical qualities of sympathy, sense of justice, and the like, Mr. Morgan is extremely judicious; he traces the former to the projection of the shadow of feelings, of which the animal itself is conscious, into others, and the latter to its antipathy to any breach of routine—a marked character not only of the animal but also of the child and the savage.

When so much is being written attributing impossible qualities to the animal mind, it is refreshing to meet with a work so free from bias, at once careful in its observations and unimpeachable in its psychology, especially when there is added the clearness of style and freshness and charm of illustration which mark this as well as Mr. Morgan's earlier works.

J. L. McIntyre.

Kunstwissenschaftliche Studien. Von Ernst Grosse. Tübingen: Freiburg, i. B., und Leipzig, 1900. Pp. 259.

These chapters are intended as Prolegomena to a series of more special studies which are to follow them. The problem of the Science of Art (*Kunstwissenschaft*) is the understanding (*Erkenntniss*) of the phenomena which are comprehended under the name of Art, of their nature, causes and effects. The author's view seems to be determined by three main contrasts to the history and philosophy of art as hitherto represented. The art work of the lower peoples has been inadequately investigated; the direct evidence of the artist's inner life has been neglected; and the definitions of particular arts have been conjured out of an assumed idea of art in general, whereas the notion of "art" should be abstracted from a study of "the arts". On this latter point it may be observed that he admits the order of exposition to differ from the order of inquiry, and himself takes advantage of this reservation so far as to follow his introductory chapter immediately by an exposition of the essential nature of Art (*Wesen der Kunst*). Perhaps the philosopher might claim a similar privilege on similar grounds. None the less the author is convinced that the regular building of science has yet to be erected "on the ground now cumbered with the tents and booths of questionable philosophical theories". I may say at once, so as not to recur to the subject, that I do not think he realises how much experience and insight have gone to the making of the theories which he disparages: nor how entirely his own endeavour towards a science of art falls within the outlines which were drawn a century or even two score of centuries ago. His strong point is plainly the study of Chinese and Japanese art, together with that of the lower peoples. Here is, unquestionably, an opening for valuable research, which may add new life to the general theory of art by bringing it into connexion with anthropology, and may throw a completely new light on multitudes of its details.

For the Essence of Art, then, the author follows Schiller's play theory, and finds the fundamental attribute in Freedom, alike for artist and spectator. In separating the enjoyment of the spectator sharply from the enjoyment of the artist he seems to neglect such obvious experiences as those of reading poetry, singing, dancing, performing music, together with the general conditions of sympathy and intelligence in appreciating beauty. Of course the spectator does not in thought repaint the picture which he looks at; but if, as I think the author would maintain, he looks at the scene represented through the artist's eyes, he surely in his degree must have done the brain work and felt the mood which the artist has felt and done. On the other hand, I welcome the author's outspoken criticism of the extreme doctrine of *Einfühlung*. If it means, he says, that what we feel we feel in and through ourselves, it is surely not new. If it means that the

perception of a form at rest must be translated into feelings of movement before we can enjoy it æsthetically, it can hardly be universally true. It appears to be Idealism (I shall add to the author's remark) of a partial and arbitrary kind.

It seems to me a pity that in working out the play theory he denies the quality of Æsthetic "*Schein*" to Music, Architecture, and the Decorative Arts, on the ground that they are not representative. Music, surely, as Plato and Aristotle agreed, is the strongest, though the purest æsthetic semblance, plucking out the very heart of things. And architecture and decoration are arts only in as far as they have a "show" distinct from their utility.

The following chapter, on the Essential Nature of the artist (*Wesen des Künstlers*) presses the conception of the unconscious creativeness of genius, as opposed to the deliberate constructiveness of talent, to what seems an undue pitch; and hence the writer shows great reserve in treating the work of art as the self-revelation of the artist. I am inclined to complain that the facts and ideas on which these conclusions depend are treated with too little reference to ordinary human nature, in which they would all be found to centre without the sharp separation which they present on the surface. Creative genius is unconscious and involuntary in its operation. So is the process which brings back a name I have forgotten; it will come back when it chooses, and nothing I can do will fetch it. A genuine artist is transformed when he is at work; so is my awkward and indolent friend the moment he mounts a horse. All this is really nothing against the unity of the artist's personal, ethical, and æsthetic character, though it is, of course, true that a great intelligence which has given itself wholly to formative art may hardly retain power to express itself in any other way. The same effect may be produced by science or politics. I am incredulous, however, as to instances in which it is alleged that a really great artist has no greatness at all in the rest of his personality. It was not true of Turner. I admit that I have not the knowledge to deal with the case of Benvenuto Cellini.

Art and Race is the subject of the next chapter. The difficulties of studying either the same race under different conditions or different races under the same conditions are elaborately brought out. The author explains clearly the difference between a true race, whose characters are practically permanent, and a people, whose character depends on a common culture. But as the most important art belongs to "peoples" of highly mixed race, and as many conditions interfere with the pure expression of racial qualities even in the less mixed populations of the world, there appears to be little that can really be identified as racial in art, with our present knowledge, though the author hopes that more elaborate studies and comparisons may remove the difficulty. It may be doubtful whether the lesson of the inquiry will not prove to be that the "people" will have to be taken as a unit, at once

as a "breed," however mixed in origin, and as a type of culture, and the attempt to disentangle pure racial character in art abandoned, except for such very general features as distinguish, *e.g.*, the Negro stock from the Mongolian. The author has paid much attention to instances in which the reputed art of a country is really produced by resident aliens, which tend to complicate the question still further. Thus the famous Satsuma ware of Japan is really, it seems, the work of an imported settlement of Koreans, who did not intermarry with Japanese, and the Athenian potters were in many cases foreigners. In ascribing with the author the decadence of Greek civilisation in the fourth century B.C. to a mixture of foreign blood, there is some risk of the disaster of assigning an adequate and real cause for an effect which does not exist. Few ideas are changing so rapidly to-day as our views of decadence. The chapter closes a critical discussion of considerable value with the remark that the confession of ignorance is the beginning of knowledge.

The effects (*Wirkungen*) of pictorial art come next. The earlier part of the chapter, which deals with the monumental uses of early plastic and painting, reminds us to some extent of Dr. Hirn's treatment of the origin of art in practical needs. The religious importance of the portrayal of deities is also discussed, with a recognition of it as meeting a popular need, to a degree which we should probably not find applicable to the English mind —an interesting question. And the effects of a people's pictorial art on its perceptive powers and habits are very suggestively traced. A discussion of the peculiar felicity with which the Japanese artists represent, and the people perceive, motion as opposed to form, seems to indicate a line in which the author might be of great service to æsthetic science, by turning his unusual knowledge of Chinese and Japanese art to account, in a complete and workmanlike study of its æsthetic peculiarities. In the same way, in the last chapter of the book, on the effect of Science on Art, we are confronted with the views of Japanese artists and critics on the want of unity which Naturalism produces in Western pictures. A poem (*Dichtung*) in colour or form, is what the Japanese thinks a picture should be, and our desire for correctness of detail strikes him merely as a prejudice, the source of æsthetic vices. The view, however, that Science is the cause of our Naturalism seems not quite adequate, though it points to a truth. The love of the spirit of Nature, which underlies both organic Science and Naturalistic art, goes back to the eighteenth century sentimentality and Thompson's "Seasons," and even, in a sense, to the early days of Christianity. Wordsworthian or Rousseauite Nature worship has little to do directly with science, though they have a common root.

On the whole, the book has disappointed me a little, though I have learned very much from it. Schopenhauer is the writer's chief philosophical authority. I see no trace in him of Kant or

Hegel. His illustrations of European art are not such as Englishmen can readily follow. Böcklin, Gotthelf, Keller are names frequently mentioned with the very highest praise. I do not doubt their excellence; but I feel a slight one-sidedness in the way in which they are put forward. The promised special studies will probably be more valuable than the present Prolegomena.

BERNARD BOSANQUET.

Die körperlichen Aeusserungen psychischer Zustände. Von A. LEHMANN. Leipzig: O. L. Reisland, 1899. Pp. viii., 218.

THE record of experimental work on the organic changes accompanying emotional and other psychical states has been very disappointing. The earlier investigators obtained definite results, which seemed to show that each emotion has its characteristic physiological accompaniments, and it was on the basis of such work that the view was advanced that the organic changes were not merely the expression of the emotion but were the essential factors in the production of the emotional condition.

As time went on, the organic changes accompanying emotional conditions were found to be less and less distinctive, until the latest workers have failed to find any essential difference in the organic accompaniments of such opposed states as pleasure and pain.

The present work of Lehmann, which deals mainly with plethysmographic observations, gives the whole subject a fresh starting-point. He makes a hopeful beginning by finding difficulties in the subject of which previous workers have shown little appreciation. He finds that the characteristic accompaniments of a given mental state may be obscured, or even completely neutralised, by those of some other mental state existing with it. Thus the characteristic effect of painful sense stimulation may be obscured or neutralised by a co-existing condition of expectation (*Spannung*). According to Lehmann, pain is accompanied by marked diminution in the volume of the arm, together with certain changes in pulse and respiration. Expectation, on the other hand, is accompanied by an increase in the volume of the arm, and if both states exist together, the change in the volume of the arm, which is one of the characteristic features of each state, may be entirely absent. Similarly, the characteristic accompaniment of pleasure may be obscured or neutralised if there is a co-existing condition of concentrated attention; the less concentrated the attention, the more marked are the changes characteristic of pleasure.

Every one who has awaited the occurrence of a psychological experience under experimental conditions must have met with the difficulty of remaining in a receptive frame of mind. One

tends to follow out some train of thought on the one hand or to pass into a vague, absent-minded condition on the other. Lehmann finds that each of these states shows its influence clearly in the plethysmographic tracing, and each may obscure the record of the state which it is desired to investigate.

If these facts are true, and there is little reason to doubt them, they go far towards explaining the unsatisfactory results of previous work. When taken into account, Lehmann finds that every mental state has its characteristic physiological accompaniments, consisting not only in a given association of organic changes, but also in a given sequence of such changes. Like earlier workers, and in accordance with his own earlier work, he finds that pleasure and pain are accompanied by organic changes of an opposite kind. With painful sense stimulation there occurs, according to Lehmann, marked sinking of the volume curve, which continues for some time, and is associated with diminution of both height and length of the pulse. With pleasurable sense stimulation, on the other hand, there is, after a slight initial fall, a rise of the volume curve above its normal level, while the pulse beats are increased both in height and length.

In the experimental production of the states of pleasure and pain, Lehmann has used sense stimulation, and the objection might well be raised that we have no means of telling how far the changes produced are physiological effects due directly to the sense stimulation, and how far they are the results of the state of feeling produced by the stimulation. Lehmann answers this objection by further interesting observations. He finds that in nitrous oxide anæsthesia, the organic changes do not occur and that in partial anæthesia the organic changes are proportional to the amount of pain experienced. He also finds that in hypnosis, suggested conditions of pleasure and pain are accompanied by exactly the same changes as those which occur when the conditions are produced by sense stimulation.

The part of Lehmann's work which seems most open to objection is concerned with his methods of producing the mental states to be investigated. For conditions of pain, he has used chiefly unpleasant tests, such as those of acids and quinine, and cold applied to the skin. He has not employed pressure on the skin, although such an instrument as Cattell's algometer would give him a simple means of producing painful sense stimulation which can be readily graduated to any intensity. More decided objection may be raised to Lehmann's method of studying attention. As means of producing this state, he used arithmetical calculations, learning series of nonsense syllables by heart and counting groups of irregularly distributed dots. Among other changes he finds irregularity of the respiration to accompany these operations, and regards this as one of the characteristic organic accompaniments of attention. It seems unlikely that concentrated attention should be associated with irregularity of bodily processes, and I cannot help sus-

pecting that the irregularity has its source in the movements, especially of the head and eyes, which would occur in Lehmann's methods, and especially in counting irregularly distributed dots. Some observations which I made some time ago are in favour of this supposition. I was engaged in studying the periodical variations of after-images and recorded my respiration while observing the after-image, with the object of finding if there was any agreement in the periodicity of the two processes. In this work I concentrated my attention, first on a given visual stimulus, and secondly on a fixation point while I awaited the series of after-images. It seems to me that my mental state was much more nearly one of pure attention than in any of the methods employed by Lehmann, and my respiration was extremely regular. I am inclined to ascribe the differences between Lehmann's result and my own to the presence, in the one case, and absence in the other, of movements of the head and eyes.

Lehmann's researches have great importance in connexion with the theory of emotion associated with the names of James and Lange. This theory had its original starting-point in the experimental results of Lange. When investigators found that different emotional conditions were accompanied by the same organic changes, the theory seemed to have lost its experimental basis. Lehmann's results, if accepted, restore to each emotion its characteristic organic changes, but no longer in a form to support James and Lange, for Lehmann finds that what is characteristic of an emotion is not merely a given association of organic changes but a given sequence of such changes, and, if the organic changes were the source of the emotion, the latter would not attain its characteristic features till the sequence had run its course. Further, as already mentioned, Lehmann has found that the organic changes which appear to be characteristic of an emotion or state of feeling may not occur, owing to the co-existence of another condition, and yet the emotion or state of feeling may be indistinguishable from that accompanied by the normal vascular changes. That the characteristic changes should occur with an emotion or state of feeling suggested in the hypnotic condition, must also be regarded as not easily reconcilable with James's view, and, indeed, the mere fact that it is possible to suggest an emotion or state of feeling constitutes a difficulty for the theory.

It is to be hoped that other psychologists, alive to the complexities of the subject, will put to the test and confirm Lehmann's results,[1] for his work gives new vitality to a branch of experimental psychology which seemed to show very faint prospect of bearing fruit.

W. H. R. Rivers.

[1] Unfortunately I have not had the opportunity of studying Lehmann's curves, and my account is based on the description of the curves given in the text.

Kant's Cosmogony: As in His Essay on the Retardation of the Earth, and in His Natural History and Theory of the Heavens: With Introduction, Appendices, and a Portrait of Thomas Wright of Durham. Edited and translated by W. HASTIE, D.D., Professor of Divinity, University of Glasgow. Glasgow: James Maclehose & Sons, 1900. Pp. cix., 205.

PROF. HASTIE has accomplished, in the present work, a task which will be extremely useful to all who are interested either in Kant's early views or in the origins of modern speculations as to the development of the Solar System. In addition to the translations of Kant's two works, *Whether the Earth Has Undergone an Alteration of Its Axial Rotation* (1754), and the *Universal Natural History and Theory of the Heavens*[1] (1755), there is a very full Introduction, giving the main points of historical importance as regards the origin, influence and tenability of Kant's Cosmogony; and there are three Appendices: (A) "Dieterich's Summary of Kant's Theory (1876)"; (B) "The Hamburg Account of the Theory of Thomas Wright of Durham (1751)"; (C) "De Morgan's Account of Wright's Speculations (1848)". The Appendix B is especially interesting from a historical point of view. Kant tells us (p. 30) that his Cosmogony was suggested by the account in the Hamburg *Freie Urtheile und Nachrichten* of Thomas Wright's *Original Theory or New Hypothesis of the Universe.* It does not appear that Kant was acquainted with the original work, so that the Hamburg account becomes important in judging what Kant obtained from Wright. Unfortunately, Prof. Hastie has not seen the original, but has made his reprint from a MS. copy, the correctness of which may be open to question. Though Mr. Wright appears to have indulged in some very fanciful hypotheses, it appears clearly that he was the source of a considerable part of Kant's theory. "One motive of this work," Prof. Hastie says, "has been to do justice to Thomas Wright while furnishing the means for determining exactly what Kant owed to him" (p. lxviii.); and this has been successfully accomplished in the present work. The translation, though it contains many small inaccuracies, is, so far as I have verified it, free from serious errors.

As regards the intrinsic value of the works translated, very different opinions have been held. The first, on the retardation of the earth's rotation, is extremely short (nine pages in the translation), but genuinely scientific. It points out that tidal friction is a constant cause of retardation, and that this cause, though small, is cumulative, and therefore not to be neglected. It also suggests that tides give the explanation of the fact that the moon always turns the same side to the earth (p. 10). Although its

[1] The concluding portion of this work has not been published in the translation, partly because Kant himself, in 1791, would not permit its republication, partly because what has been published is complete in itself. The part omitted has, in my opinion, no very great value.

numerical data and results are extremely far from the truth, the main conclusion is indisputable, and appears to have been first discovered by Kant (see p. xliii.).

The larger work, on the *Natural History and Theory of the Heavens*, is more speculative, being concerned with a possible origin, not only of the Solar System, but of the stars generally. Prof. Hastie thinks that this theory "will probably be regarded hereafter as the most wonderful and enduring product of his (Kant's) genius" (p. ix.). On the other hand Dühring [1] will allow no merit whatever to Kant's speculations, except that he sometimes, by accident, reaches a correct result by fallacious reasoning from false premisses. Although Dühring, no doubt, goes somewhat too far, his judgment would seem, from a scientific standpoint, to be nearer the truth than that of Prof. Hastie. Kant's premisses are usually false, and his reasoning is usually fallacious. But his theories have a value as a stimulus to the scientific imagination, and in parts they have a literary value in the almost Miltonic descriptions of "the realm of Chaos and old Night". This is especially the case in part ii., chapter vii., "Of the Creation in the whole extent of its infinitude, both in Space and in Time". The Solar System, we are told, forms part of a larger system, which is the Milky Way; the Nebulæ are in reality other Milky Ways; [2] many Milky Ways combine into a new system, and so on. To this process of forming larger and larger systems there is absolutely no end. Each system is gradually developed out of the original chaos, and different systems are developed at different times. But all perish, and return to the original chaos again. The process is then repeated, and so on *ad infinitum*. Thus the antithesis in the first antinomy represents a real stage in Kant's thought.

Kant, like Boscovich, assumes two forces, attraction and repulsion, of which the latter is insensible except at small distances. The original chaos is of different densities in different parts, and the denser parts gradually become nuclei of the heavenly bodies. The universe is originally cold, and stars only become hot in the process of contraction. The sun is supposed to be actually in a state of combustion (p. 159). The theory of the formation of planets and satellites, and of Saturn's ring, is worked out in some detail; but the arguments are always vague, and seem not infrequently to be definitely mistaken. Kant seems at times to suppose that the resultant attraction of a system on one of its particles must be directed to the centre of mass of the system. He bases an elaborate argument upon the fact that, on the whole, the eccentricities of the orbits of the planets increase with their distances from the sun. This leads him (part ii., chapter iii.) to the suggestion that, in accordance with Leibniz's

[1] *Principien der Mechanik*, third edition, pp. 390-391.

[2] It was, of course, not known in Kant's day that some nebulæ are not composed of stars.

law of continuity, there are probably planets beyond Saturn, with more and more eccentric orbits, and gradually approximating to comets. But we know that, when such planets were discovered, they were found not to approximate to comets at all. This is a fair sample of the kind of reasoning employed.

On the whole, Kant's theory is hardly to be ranked as a scientific hypothesis, not because, in its general outline, it is improbable, but because Kant wholly failed to show that it is probable. It is rather to be classed with ancient cosmogonies, among which Kant himself mentions, as similar to his, those of Lucretius, Epicurus, Leucippus and Democritus. The work is interesting because Kant wrote it, and because, in incidental remarks, it shows him as a thorough Leibnizian.[1] But the value of a work in which a bold hypothesis is put forward lies in the arguments adduced in support of the hypothesis, not in the fact that others afterwards find arguments to support it or something similar. Science, unlike theology, is concerned, not with the *enunciation* of "great truths," but with their demonstration.

B. RUSSELL.

[1] See, *e.g.*, the dictum on inertia and resistance as limiting freedom, p. 166.

VI.—NEW BOOKS.

The Neo-Platonists: A Study in the History of Hellenism. By THOMAS WHITTAKER. Cambridge, 1901. Pp. xiv., 231.

SINCE the great revival of speculative studies in the nineteenth century Neo-Platonism has been less written about and has attracted less attention in England than any other school of ancient philosophy, with the possible exception of the Sceptics. Several copious and admirable histories of that great movement have appeared in France and Germany; but none of them, so far as I am aware, have been translated into English. Within recent years, however, increased attention has been drawn to Plotinus; and the high admiration expressed for him by Prof. Gilbert Murray must have excited the curiosity of many. The moment then was opportune for the publication of a monograph on the Neo-Platonists; and Mr. Whittaker has given us not merely the best that has appeared in this country—which would be saying little—but one in all respects as good as could be made of its size. Besides a careful study of the original texts he has gone over the best modern literature of the subject; his materials are judiciously employed; and the results of much reading, aided by much reflexion, are conveyed in a clear and temperate style. More than a third of the volume is given to Plotinus—no excessive share, considering his immense preponderance over the rest of the school; a whole chapter, perhaps the most generally interesting in the book, deals with 'the Polemic against Christianity'; room is found for a very full summary of that little-read treatise, Proclus's *Elements of Theology;* and the whole concludes with a view, certainly not deficient in breadth or daring, of the absolute value of the philosophy analysed in the preceding chapters.

To all historians of Neo-Platonism the question of its origin has been one of primary importance. Was it a continuation of the pure Greek tradition, or a mere Hellenic version of Oriental theosophy making its way through the open door of Alexandria into the Western world? The second title of Mr. Whittaker's book at once indicates his position in the controversy. He stands frankly for that philo-Hellenic interpretation which has been more and more prevalent among his immediate predecessors in the field. Not only did Plotinus and his successors place themselves in line with the 'blessed ancients,' the Greek thinkers of the classical period, but they also waged war on behalf of Greek rationalism against the Oriental phantasies which were rapidly submerging Western civilisation; and it was as a part of this conflict that Porphyry and Julian struck at Christianity itself. Here Mr. Whittaker does not conceal the extent of his sympathy with what was then, but was not in after ages to be the losing side. 'The Græco-Roman world had a perception, vague at first, but gradually becoming clearer, of what was to be meant by Christian theocracy' (p. 140). And this perception translated itself into a resistance which was no mere struggle of effete super-

stition against a higher and purer faith, but, with the leading minds at least, a protest of reason against authority, of liberty against intolerance, of science against supernaturalism, of philology against forgery.

No one who submits to the rather irksome task of reading the *Enneads* through can fail to convince himself that whatever Plotinus teaches is either the repetition or the development of what had been taught long before in the schools of Athens. Even his much decried mysticism has its roots in Plato's philosophy both as regards its superessential object —to the genesis of which by the way the One of the *Parmenides* contributed perhaps even more than the Good of the *Republic*—and, Mr. Whittaker would add, the theory of its apprehension. It seems to me, however, that the greatly superior rationality of Plato as compared with his late-born disciple deserves a recognition that it does not meet with here. Enthusiasm and ecstasy, according to him, are modes of apprehending truth distinctly inferior to the conviction brought about by dialectic; they do not, as with Plotinus, involve an identification of subject and object; and they are not mentioned in connexion with the supreme principle of the *Republic* and of the *Timæus*. Apart from its mystical ecstasy Neo-Platonism has been reproached with the addiction of some of its professors to magic and theurgy. But Plotinus is altogether free from this imputation; and as regards the rest of the school Mr. Whittaker has succeeded in reducing it to a minimum, more especially with reference to Iamblichus.

In his concluding chapter our author appears rather as the apostle than as the apologist of Neo-Platonism. Its thought, according to him, is 'the maturest that the European world has seen,' (p. 210). That is a startling claim, and the plea on which it rests seems to be singularly inadequate. Neo-Platonism, we are told, is 'the result of a continuous quest of truth about reality during a period of intellectual liberty that lasted a thousand years' (*ib.*). Even if we understand 'intellectual liberty' in the most superficial sense as immunity from material penalties for the profession of unpopular opinions, the phrase is open to grave exception in presence of the treatment that befel Anaxagoras, Diagoras, Protagoras, and Socrates at the hands of what Renan has well called 'the Athenian Inquisition'. But there are obstacles to the quest of truth more deadly than the fear of hemlock; and one cannot call a thought really free that worked under the general limitations of the Greek mind, under the special limitations imposed by the religious prejudices inherited from Athens, under the formal influence of Roman imperialism, and finally under the yoke of Plato and Aristotle. Mr. Whittaker speaks disparagingly of what modern thought has done as 'isolated efforts bounded by the national limitations of its philosophical schools' (*ib.*). But this is really an admission that it has worked under more varied conditions than ancient thought and with more immunity from a fixed tradition. No better guarantee for intellectual freedom could be conceived. Besides, as no one knows better than Mr. Whittaker, modern thinkers started with Neo-Platonism fully set out before them, and on examination they have rejected its teaching, not as unorthodox but as untrue, or rather as unreal. He has devoted some pages to the bearing of modern science—for which he seems to have more respect than for modern philosophy—on the systems of Plotinus and Proclus. By an argument more ingenious than convincing he interprets the henads of the latter into ideal types prefiguring the many stellar centres of planetary life which post-Copernican astronomy supposes to be distributed through space (pp. 214-215). But he omits to point out a centre of the universe representing the supreme henad as it was once represented by our sun. The theory has

lost more than it has gained—not that either loss or gain is worth discussing. We are more interested when Proclus says that 'in the order of genesis the imperfect comes before the perfect' (p. 213). The fact is sufficiently obvious; but the important thing to notice is that in our doctrine of evolution the 'order of genesis' has been extended to existences which Proclus held to be eternal. Finally Mr. Whittaker—I will not say admits but—presses the incompatibility between Neo-Platonism and the scientific theory of entropy, the doctrine that 'the universe is running down to a state of unalterable fixation' (p. 213). Whether the doctrine is or is not true we shall never know; but one thing we do know, which is that inexhaustible sources of physical energy, such as Plotinus supposed the sun to be, do not exist; and even if there were any such we know by the best of all possible tests, the test of inconceivability, that an abstract superessential unity, such as he placed at the summit of the universe, cannot be one of them. Even Hegel is better than that sort of thing. The vagaries of contemporary speculation are almost incalculable; but one may venture to prophesy that any individual embracing Neo-Platonism as a philosophic creed will be apt to find that his adhesion is, in the language of its founder, a flight of the alone to the alone.

ALFRED W. BENN.

Sanity of Mind. A Study of Its Conditions and of the Means to Its Development and Preservation. By DAVID F. LINCOLN, G. P. Putnam's Sons. Pp. 171.

In a scientific age it would seem that often *a priori* speculations on education lead to pessimism. We are invited, for instance, to agree that education can do nothing for the idiot and nothing for the man of genius—that educational influence only counts between those extremes, if it counts at all. Dr. Lincoln's theme is the extremely depressing one of mental derangement and degeneracy, but the whole tone and tendency of his book is optimistic. In the study of economics we have learned to look for light on, say, the doctrine of rent, through the consideration of land, in the first place, under "the least favourable conditions" to ensure cultivation at all. Dr. Lincoln's task appears to be, to thrust further back the point at which education can begin under "the least favourable conditions," if not to the zero of mental capacity, at any rate to a point which to the ordinary lay-reader seems to approach closely to it. Accordingly, Dr. Lincoln's method is nothing if it is not hopeful, not to say jubilantly optimistic. After reading the book, we think his optimism is well grounded, and we rejoice at its incoming.

It might, indeed, be that an absolute idiot or an absolute man of genius would be ineducable, but the fact, of course, is that these individuals are nonentities. Dr. Lincoln seems to think there are none who are quite completely equipped in physical soundness, nervous organisation and mental balance, and whose mental balance in every respect is above suspicion. But to make up for this indictment, Dr. Lincoln's book suggests the enormous possibilities that lie before the educator (taking the term in its broadest sense) provided that he is endowed with human sympathy and with adequate knowledge of the conditions under which he has to work. And, secondly, the teacher (who by much instructing has not yet lost the power of learning) will be led to observe that he may himself be the cause of depressed vitality of life and thought, of repressed higher forms of mental activity in his pupils, by his own inadequacy of thought and feeling in the points of contact between his own mental

activity and that of the pupils. If sanity is 'harmony with one's psychic environment,' it behoves the teacher to consider the large amount of 'environment,' which he personally forms in the world of the child. It behoves him to consider how differently constituted each individual is, and to consider what may be, or rather what are, the reactions which his ways and methods, and material of instruction, are causing in the mind of the child. All this is hidden from view by the fact that usually he gives his lessons as doses prescribed by an examination syllabus, and each dose is more or less methodically constituted, so that it can apparently as far as size is concerned be swallowed equally readily by all. The heading to chapter iv. is from Wilhelm Meister: "Alas! how much there is in education, in our social institutions to prepare us and our children for insanity". This is a hard saying, but the chapter is worth reading patiently by teachers.

Dr. Lincoln quotes from Clouston: "Child mathematicians, child musicians, and child poets, are rare, and we know they are all more or less pathological. I think that development of any faculty or power in a boy or girl, in a lad or maiden under twenty-five that is premature in time, or that is clearly out of proportion to other faculties and powers, should be carefully watched and looked on with much medical suspicion." This, be it noted, is the latest word of medical science, in an age of specialism, and one fears, it must be added, of a tendency to *early* specialisation.

Dr. Lincoln has strong views with regard to our social and civic duties to the insane and imbecile. The question of statutory regulation of marriage of defectives introduces the idea of "limits," which seems to be in danger of being arbitrary, not to say tyrannical, against the rights of the individual. Yet the burden to the community of morbid inheritance is so great that the whole question must come into the range of social and civic duties. But it is clear, and this is Dr. Lincoln's view, that public opinion must be formed before legislation can be effectively brought to bear.

Dr. Lincoln's book brings us back to the delicate and intricate work of the educator. The education of a child is, as it were, held in commission by the parent, the teacher, the medical man, and by others. These factors must, if education is to reach its best usefulness in their various combinations, find a common denominator. The fact is that the study of the child is most complex. At present the teacher is not equipped with the matter of the sciences underlying his work. He thinks his work consists in advancing with all speed his best pupils, and getting examinational results from the brilliant, and giving "average attention" to the dull, to "give them a chance". The whole attitude requires a change. To Dr. Lincoln, as a medical man, it is the dull, listless, defective child that claims special attention. When the teacher begins to take a similar interest in the bottom boys of his form, as being the special glory of his art, it will not merely be good for the dull and the stupid, but there will follow an insight into the best methods of teaching and training the best boys as certainly as, by the laws of economics, rent of land increases according as the advantageous conditions of its cultivation increase over the land which is good enough to just repay cultivation. Dr. Lincoln's convincing exposition of the educability of children of ill-regulated minds and of the most attenuated powers is optimism of the most inspiriting kind to the teacher of children of ordinary and higher mental power.

We have attempted to point out the significance of Dr. Lincoln's book to the educator, but it is with regard to education of defectives by

special treatment by the doctor, the teacher and society that his book is directly and principally concerned. The chapters are entitled, The Outlook, The Nature of Mental Derangement, Degeneracy, Education, Self-Education, Our Social and Civic Duties. The work is an introduction to the subject. It is as little technical as could be. It is lucid and succinct in exposition and, as we have said, it gives ground inferentially for a highly hopeful outlook for the future of education under the most advantageous conditions.

FOSTER WATSON.

The Methods of Ethics. By HENRY SIDGWICK, sometime Knightbridge Professor of Moral Philosophy in the University of Cambridge. Sixth edition. London: Macmillan & Co., Limited; New York: The Macmillan Co., 1901. Pp. xxxvi., 526.

Prof. Sidgwick began the revision of *The Methods of Ethics* for this edition, and carried it through up to page 276. The illness, which was so soon to terminate fatally, prevented him from carrying it further, and the rest of the book was, by his wish, seen through the press by Miss E. E. C. Jones.

The chief changes in this edition are to be found in chapters i.-v. and ix. of book i., and chapters iii. and vi. of book iii., in the addition of an Appendix on, "The Kantian Conception of Free Will," and the inclusion in the Preface of the brief history of the development of Prof. Sidgwick's ethical view, which was printed in the Notes in MIND for April last. The account which appears in the Preface, however, differs slightly from that in MIND, as after the latter was printed a page which had been mislaid was recovered, and was found to fit the gap conjecturally filled by the passage in square brackets on page 290. The passage beginning, "'But reading him at this stage," now runs as follows:—

"But reading him at this stage with more care, I found in him, with pleasure and surprise, a view very similar to that which had developed itself in my own mind in struggling to assimilate Mill and Kant. I found he expressly admitted that 'interest, my own happiness, is a manifest obligation,' and that 'Reasonable Self-love' [is 'one of the two chief or superior principles in the nature of man']. That is, he recognised a 'Dualism of the Governing Faculty'—or, as I prefer to say, 'Dualism of the Practical Reason,' since the 'authority' on which Butler laid stress must present itself to my mind as the authority of reason, before I can admit it.

"Of this more presently: what I now wish to make clear is that it was on this side—if I may so say—that I entered into Butler's system and came under the influence of his powerful and cautious intellect. But the effect of his influence carried me a further step away from Mill: for I was led by it to abandon the doctrine of Psychological Hedonism, and to recognise the existence of 'disinterested' or 'extra-regarding' impulses to action, [impulses] not directed towards the agent's pleasure [*cf.* chapter iv. of book i. of *The Methods of Ethics*]. In fact as regards what I may call a Psychological basis of Ethics, I found myself much more in agreement with Butler than Mill.

"And this led me to reconsider my relation to Intuitional Ethics. The strength and vehemence of Butler's condemnation of pure Utilitarianism, in so cautious a writer, naturally impressed me much. And I had myself become, as I had to admit to myself, an Intuitionist to a certain extent. For the supreme rule of aiming at the general happiness, as I had come to see, must rest on a fundamental moral intuition, if I was to

recognise it as binding at all. And in reading the writings of the earlier English Intuitionists, More and Clarke, I found the axiom I required for my Utilitarianism, [That a rational agent is bound to aim at Universal Happiness], in one form or another, holding a prominent place (*cf. History of Ethics*, pp. 172, 181).

"I had then, theoretically as well as practically, accepted this fundamental moral intuition; and there was also the Kantian principle, which I recognised as irresistibly valid, though not adequate to give complete guidance. I was then an 'intuitional' moralist to this extent: and if so, why not further? The orthodox moralists such as Whewell (then in vogue) said that there was a whole intelligible system of intuitions: but how were they to be learnt? I could not accept Butler's view as to the sufficiency of a plain man's conscience: for it appeared to me that plain men agreed rather verbally than really."

The Meaning of Good. By G. Lowes Dickinson. Glasgow: James Maclehose & Sons, 1901. Pp. xvi., 231.

A new Philosophical Dialogue is a thing somewhat unexpected. The task of harmonising good drama and good reasoning is naturally not an easy one, and has often ended in failure. Yet the work before us is by no means a failure. This result is no doubt largely due to Mr. Lowes Dickinson's skill, but it is open to question whether with different aims he would have been equally successful. As it is, his purpose being suggestive and not dogmatic, one agrees that he has chosen the literary form best suited to it, and agrees all the more readily because the dialogue exhibits no lack of dramatic feeling. In fact its author seems equally accomplished in the parts of Socrates and of Plato.

With the general position of the whole work it is difficult to find fault; but for this very reason the first book is perhaps more valuable than the second. If the discovery of Good is a progressive interrogation of experience, we cannot find The Good till experience is complete. All attempts to fill in the content of the Perfect State must necessarily be unsatisfactory, because experience is incomplete. Life as we know it is not perfect, and cannot for that reason supply the content of a perfect life. In actual practice we do, and of course must fill in the content of heaven by selecting from our experience the elements that we most prize in it, but no one can say that the result is satisfactory. Our thoughts of heaven vary with our moods. To-day we may be in an energetic mood and look forward to a heaven of activity, while to-morrow we may be more inclined to sympathise with the weary charwoman who addressed her friends with her last breath:—

> 'Don't mourn for me now, don't mourn for me never;
> I'm going to do nothing for ever and ever'.

Nevertheless it is difficult to imagine a better guess at heaven than that offered by Mr. Dickinson.

Mr. Dickinson is not so clear in his use of the term 'Good' as one could wish. Here and there a contrast is implied between The Good and Moral Good, and in one place the latter is spoken of as merely a means to the former. But if The Good is what it must mean—that which gives complete satisfaction, it will satisfy our whole nature, which surely must include our moral nature. No doubt in life as we experience it, there is a want of harmony between the different values which we set on things, and for this reason life entails a certain amount of sacrifice. We can't get all we want, and so we have to take what is most worth taking

and discard the rest. What is morally good is often unpleasant; and in spite of Keats who tells us that all we need to know is that

Beauty is Truth, Truth Beauty,—

Reality is often ugly enough. But this is certainly because what is is imperfect. Such experience affords no test of The Good, which is *ex hypothesi* perfect. Ideally the Right, the True, the Beautiful, and the Pleasant must coincide, and The Good must include them all. Even with experience as it is the right course may be the pleasant one.

For similar reasons, though one agrees with Mr. Dickinson, that The Good is not to be identified with The Beautiful, yet surely we cannot imagine a Perfect Good that is not beautiful, just as surely as we cannot imagine a Perfect Good that is not pleasant or real.

The dialogue is interesting throughout, touching as it does on a number of important questions, and contributing to most of them some valuable observations. One of these may be quoted in conclusion. 'Life is a dangerous thing, and nothing we can do will make it safe. Our only hope is courage and sanity.'

E. V. SLATER.

Whence and Whither. By Dr. PAUL CARUS. Kegan Paul, Trench, Trübner & Co.

This little book professes to be an investigation into the nature of the soul, its origin and its destiny. The author sets out with the boast that he intends 'to systematise the facts without resorting to hypothetical assumptions' whether religious or metaphysical. But in spite of these brave words he is soon found floundering in the morasses of dogmatism. 'The soul,' he tells us, 'is not that which feels and thinks and acts, but is the feeling itself, the thinking itself, the acting itself.' We must not say 'I think,' but use the impersonal, 'It thinks,' just as we say 'It rains'. Yet the soul is defined as 'a complex organism,' 'a system of sentient symbols'. Again he says 'Man's thoughts are sentient images of the things and relations of the objective world; and thinking is simply a combining of these sentient images'. Yet he has no hesitation in grafting a kind of Platonic idealism upon this sensationalistic psychology. Ideas are the prototypes of existence; 'they have nothing to do with sense or sensibility; they are purely mental; they can be grasped by the mind only'. 'We do not produce ideas, but ideas produced in the cerebral processes of a brain become conscious and thus *they* produce *us*.' As a specimen of the author's power of definition we may quote the following: '*Heredity is the law that the same, so long as it remains the same, will in reproducing itself, continue to be the same*'. As a result of such speculations he concludes that the soul is a knot made of many and various strands—chemical elements, tendencies and ideas—our heritage from the past. At death the knot is loosened, but the strands still persist to be tied in other knots. Our criticism is already too long, but we must protest against this pernicious type of so-called religious treatise. Dr. Paul Carus has given us a most indigestible farrago of thoughts (or words) gathered from many philosophies, sciences and religions, richly seasoned with copious translations from German poetry, and served up in a phraseology, no less nauseous to common sense than to philosophy.

A. J. JENKINSON.

Truth and Reality. By John Smyth, M.A., D.Phil. T. & T. Clark, 4s.

This work was written as a thesis for the D.Phil. Degree of the University of Edinburgh, and it appears, from the author's preface, to have won 'the coveted honour'. Dr. Smyth regards the world from that idealist point of view, not uncommon nowadays, which despises 'the answers that Kant gave to his times,' and sneers at 'the hash of Hegelian dialectic,' and deems itself not incompetent 'to give a right conception of life for the present age'. He deals cursorily with naturalism and erroneous or defective idealistic theories. He disposes of the former 'in brief space,' not by meeting it upon its own ground, but by assailing it with the abstract arguments of the class-room, an artillery as noisy as it is ineffective. The latter are accused of leaving out of sight half the facts, of confining the spirit within the limits of the speculative reason, of ignoring error and evil. If the real is the rational, can we, asks Dr. Smyth, say that evil and error are rational, or can we deny that they are real? His solution of the dilemma is interesting. Evil and error are not unreal, but 'non-real,' to which category is added the world in space and time. While we have no quarrel with the author's aims, we cannot recommend the book. Its tone is bombastic; it abounds in irrelevancies; in phraseology it is excessively wordy; and we must confess to having frequently failed to unearth the meaning of a paragraph in spite of headings and summaries.

A. J. Jenkinson.

The Story of Nineteenth Century Science. By H. S. Williams. New York and London: Harper Bros. 1900. Pp. x., 475.

This work consists of an introduction on science at the beginning of the century, and of chapters dealing with astronomy, palæontology, geology, meteorology, physics, chemistry, biology, anatomy and physiology, scientific medicine, experimental psychology, and unsolved scientific problems. The 116 illustrations are, for the most part, portraits of eminent men of science. The book, as a whole, makes a good impression, which is not lessened by the provision of an excellent index.

We are here concerned with the chapter on experimental psychology—which is disappointing. Much space is devoted to the reform in methods of treatment of the insane, the early work on the medullated nerve fibre, cerebral localisation, and the histology of the nervous system. The only psychological topics touched on (and these are handled in the crudest way) are reaction time, Weber's law, and the state of hypnosis. The chapter furnishes one more proof of the difficulty which meets the student of natural science, when he seeks, from book knowledge only, to adopt the psychologist's standpoint. Half an hour's conversation with the workers in a psychological laboratory would have saved Dr. Williams from a misleading superficiality of treatment.

Intelligence in Plants and Animals. By T. G. Gentry. New York: Doubleday, Page & Co. 1900. Pp. 489.

"The possession of soul and spirit can be predicated no less of plants than of man and the lower animals." "In announcing this belief, the author but expresses a conviction as deep as any that could occupy a human mind." "We promised ourselves . . . a brief treatment of the most interesting life-forms of this planet of ours in the light of their ways and doings, and the direction of human thought to those traits of

character and manifestations of conscious intelligence which fit them to become partakers with man of that new life which awaits him beyond the grave." These quotations sufficiently indicate the purpose of the work under notice. The writer, seeking to follow in the footsteps of the late J. G. Wood, gives a series of instances of 'intelligence,' ranging from the Venus fly-trap through insects, fish and snakes, to the higher mammals and birds. He is evidently an ardent student of natural history, and especially well versed in bird lore. But his main thesis is untenable, and the scientific nature of his book is thereby impaired.

There are eight excellent photographic plates from nature, and many woodcuts of very various merit. The frontispiece, referred to as a portrait of the author, is labelled, Snapping Turtles Fighting. There is no index.

Truth and Reality, with Special Reference to Religion; or, a Plea for the Unity of the Spirit and the Unity of Life in all its Manifestations. By JOHN SMYTH, M.A. (New Zealand), D. Phil. (Edin.). With introductory note by Prof. R. FLINT. Edinburgh: T. & T. Clark, 1901. 8vo. Pp. xvii. + 244. Price 4s.

This is a dissertation submitted to the University of Edinburgh for the degree of Doctor of Philosophy and rewarded with that coveted distinction. The author commands our sympathy, both for what he maintains and for what he opposes, and also for the tone of moral enthusiasm which pervades his work. To quote his own words: "The writer's main aim is to point out that the roots of philosophy and of religion, as of morality and of natural science, lie in the constitution of the human spirit; and that, therefore, their questionings, methods, inquiries and results are as much a process of reason as is logic itself, and that their basis and objects belong truly to the constitution of things, if anything does". In the course of maintaining this thesis the author has just occasion to find fault both with naturalism and with the idealism which errs by laying stress upon the intellectual side of our nature only, to the neglect of other sides no less essential. As to the philosophic content of the work we cannot say it is commensurate with the enthusiasm of the writer. His is the fervour of the preacher who would call men to the truth by faith rather than the patient analysis of the thinker who dare not say he believes more than he proves by mere human reasoning.

HENRY STURT.

Les Approximations de la verité; étude de philosophie positive ou expérimentale. Par HERVÉ BLONDEL. Paris: F. Alcan, 1900. Pp. xii., 239.

The object of this study is to give a condensed account of the positivist philosophy, making allowance for the progress in science and speculation since the appearance of the *Cours de philosophie positive*. Although emphatic in his allegiance to positivist principles, M. Blondel repudiates Comte's later teaching. He argues that towards the end of his life the master was unfaithful to true positivism, and made dangerous concessions to mysticism and the recognition of the Unknowable. Thus M. Blondel is closely in alliance with the "hyperpositivism" of a better-known writer, M. de Roberty. Granted that this is a valuable form of philosophic doctrine, M. Blondel's book has value as a lucid and agreeable compendium. His explanation of psychology is that of biological sociology; and he regards the primary qualities of matter as unexplained, though hardly unexplainable.

Dix années de philosophie ; études critiques sur les principaux travaux publiés de 1891 *à* 1900. Par LUCIEN ARRÉAT. Paris: F. Alcan, 1901. Pp. vi., 179.

This little volume skims lightly over the philosophical literature of the closing decade of the nineteenth century. The author has done a good deal of reviewing in French and American periodicals, and here we have apparently a *rechauffé* of his contributions. The material is very much that of the average book review, a short statement of the main points of the works dealt with, and a little discriminating criticism. English philosophy is almost entirely left out, the exceptions being the æsthetic writings of Prof. Haddon and Vernon Lee. But the book may have some usefulness in England as a short guide to what has been done recently on the other side of the Channel.

Prolégomènes à l'Esthétique. Par L. DIMIER. Paris: Aux bureaux de la Revue de Metaphysique et de Morale. Pp. 37.

The author proposes to himself three questions:—

"Est il possible de fournir une définition du beau en soi?"

"Peut on constituer l'esthétique sans le secours d'une telle définition?"

"De la science constituée d'accord avec la réponse qu'on fait à ces deux questions, quel est le rôle et l'utilité taut à d'autres égards qu' à celui de la philosophie elle-même?"

The answers which he provides to these questions are: to the first, that no such definition can be found because beauty-in-itself can only be a property of the thing-in-itself, of which we can know nothing: to the second, that since we certainly do attain to a certain phenomenal beauty, and since this, to which we always really refer by the name of beauty, is realised by definite processes of imitation, we can study these processes without a definition of beauty-in-itself: to the third, that Æsthetic thus constituted, avoiding any question as to what is metaphysically implied by imitation, will content itself with the elaboration of technical laws; that the advantage of such a science to the artist is obvious; that to the philosopher it will be at least as interesting as mathematics or natural science.

The conception of Æsthetic thus set forth seems to treat it less as a part of philosophy than as one of the sciences with which philosophy will deal.

Contenting itself with a registration of methods, of the rules of perspective for instance, and the harmonising and even the mixing of colours, it will relegate to philosophy such insoluble questions as the meaning of beauty and of imitation.

Though the author draws an analogy between this science of imitation and the sciences of logic and of morals, he surely should in strictness compare it only to grammar and to law. For not on their most formal side can logic and ethics entirely disregard metaphysical problems.

E. F. CARRITT.

Mein Recht auf Leben. Von Dr. HEINRICH SPITTA, a. o. Professor der Philosophie an der Universität Tübingen. Tübingen, Freiburg in Breisgau und Leipsig: J. C. B. Mohr, 1900. Pp. xi., 468.

Both for the general reader and for those who are especially occupied with moral theory, Prof. Spitta's book is likely to have considerable

interest. The author's main thesis is the idea of immortality, with a defence of which in a peculiar form the work is for the most part taken up. By way of introduction there is also an attempt to show that the human struggle for life is not incompatible with morality, or rather that it is not even intelligible except as a field for the realisation of the moral purpose. While some good remarks are offered in this opening discussion, two points may perhaps provoke criticism. In the first place, though Prof. Spitta deals with the possible moralisation of the human struggle, he gives no suggestion as to the way in which the competition in the whole complex of living things is to be understood in accordance with a moral principle; and yet this seems a point that should be the very beginning of moral theory. And secondly, the author argues that the pursuit of science or of art cannot make a satisfactory content for the individual life. But reasonings of this sort always seem to prove nothing, or to prove too much; either the value of science and of art is really left unassailed, or in their fall morality is involved also. The sharp separation between truth, beauty and goodness cannot successfully be maintained; if absolute worth is denied to any one of the three, all unconditional worth is implicitly made impossible.

The treatment of the main thesis demands more examination. Prof. Spitta defends the Kantian postulate of immortality, but defends it in such a modified shape as threatens to deprive it of the chief force it had originally. The Kantian postulate of immortality really rested on this: since the command of duty is absolute and unconditional, a man must assume that he cannot be annihilated till he has fulfilled its bidding; but as the task can at no time be completely fulfilled by a finite will, therefore an infinitely prolonged existence must in each case be postulated. Prof. Spitta, however, postulates a future life on the ground that the individual moral task must somewhere be completely performed. But the future life demanded by this argument is only finite; death, taken in a metaphysical sense, is a little postponed, not removed altogether. There is wanting the nerve of the postulate; which is, divested of Kantian formality, the interest in continued moral struggle. If this struggle is at some time completely overcome, any further existence of the soul, since it is irrelevant, cannot be in a genuine sense postulated.

A more surprising thing in Prof. Spitta's treatment of the postulate is that he should have, in spite of the general warning given by Kant, carried it further, attempting to show that existence after death is required in such a way that we must assume the continuance of the soul in conditions similar to the present, *i.e.*, in other bodily lives which will form a series. In support of this view, the author adduces all kinds of testimony, including the not very reassuring sentence of Hume. But more than this is needed to make it clear that the theory really offers any solution of the moral problems. Prof. Spitta demands the final and definite completion of the moral task in the soul; but reincarnation does not guarantee such completion. And even if the end of the moral struggle be assumed as assured, then (as was said above) the question of immortality must be discussed afresh. Moreover the theory brings new difficulties of its own. To take only one, it is hard to see what is gained by reincarnation if the soul forgets the past. Apparently former states are wholly forgotten, as Prof. Spitta himself admits, for he is not ready to hazard Pythagorean recollections himself nor to accept them from others. And yet, if reincarnation is to be intelligible, the previous lives must be at some time remembered. The question naturally arises, how and when the soul will come to that needful reminiscence. Only the wildest assumptions can give an answer here; and to admit any one of

them is directly to give the lie to Spinoza's great hope of philosophy—*paulatim præcipitantia fingendi evanescet.*

As regards the method of the work, the author says in his preface: "Metaphysik im engeren Sinne habe ich nicht treiben wollen". Technical discussions therefore are not to be expected; and no doubt it is due to this that the metaphysical positions taken up have the air of being rather provisional, and sometimes a little vague. As far as style goes, the author must be congratulated on his clearness and facility; and the book, though perhaps somewhat disproportionately long, is throughout enlivened by a great play of quotations and allusions.

J. A. J. DREWITT.

Der Gesang der Vögel: seine Anatomischen und Biologischen Grundlagen. Von Dr. VALENTIN HÄCKER, Professor in Freiburg in Breisgau. Jena: Gustav Fischer. Pp. 102.

The main results of this interesting little work may be stated very shortly. Starting from the important physical fact, which is illustrated by appropriate diagrams, that in our singing birds the voice-organs of both sexes are essentially the same in kind, while those of the female are less strongly developed than those of the male (p. 27), Prof. Häcker, differing in this from Darwin, infers an original stage of voice-power in which the two sexes were exactly alike; a stage, that is, in which the power of true song was not as yet acquired by the male, and in which both sexes communicated with each other on equal terms, so to speak, and for the same purposes. Those purposes, most essential to the preservation of the race, he considers to have been in the main the keeping together of the members of a species in migration, or in the search for food; they were, in fact, the call-notes with which ornithologists are so familiar. From these notes the true song has gradually been developed in the male only; for among the singing birds it is almost invariably the male that performs the work of courtship, and the voice-power, once acquired, would naturally be developed more especially in the service of that passion which is the most intense in all animals (p. 57). Thus a dimorphism of the two sexes in regard to the voice-organs has begun, and is no doubt increasing.

With regard to the songs themselves, and their use for the preservation of the species, Prof. Häcker distinguishes the song in courtship, of which the use is obvious, the song after courtship and during the nesting-time, when it is used to keep the sexual activity, especially of the female, at its full height, and thirdly, the extra-nuptial song, heard after the moult in the case of some species, and even in mid-winter, of which the value is not so clear (p. 51). Darwin looked upon it as practice of the voice, in order to retain the power: Spencer and Wallace rather as the expression of an overflowing vitality or of physical comfort; and in both these explanations Prof. Häcker seems to see probability. The autumn and winter singers need, however, to be more carefully observed before we shall be able to come to any very definite conclusion as to the meaning of the song at this season: and herein lies a good field of careful observation and record for the ordinary field ornithologist.

Monistische Gottes- und Weltanschauung. Versuch einer idealistischen Begründung des Monismus auf dem Boden der Wirklichkeit. Von J. Sack. Leipzig: Engelmann; London: Williams & Norgate, 1899. Pp. viii., 278.

Mr. Sack begins his philosophic profession of faith with the well-worn formula of Kantian agnosticism: "Logical reasoning can tell us nothing about supersensuous realities; it can only take account of phenomena". As we cannot resist our impulse to explore these realities, he concludes that we must use a method of analogy; we must regard the human soul as analogous to the cosmic soul and reason from one to the other. From this programme we might expect a criticism of the content of human consciousness with the object of ascertaining what elements may be attributed to the world-consciousness and what is merely finite and human. No such criticism, however, is attempted. The author merely picks up organic development, æsthetics, morality and religion one after the other, and gives a short genetic and theoretic account of each. What he has to say about them is by no means original. He makes no real contribution at all to the doctrine of monism, and his whole performance lacks point and unity to a surprising degree.

Minorenni Delinquenti. By Lino Ferriani. Milano: Max Kantorowicz, 1895. Pp. 570.

Delinquenti Scaltri e Fortunati. By Lino Ferriani. Como: Omarini Vittorio, 1897. Pp. 578.

Delinquenti che Scrivono. By Lino Ferriani. Como: Omarini Vittorio, 1899. Pp. 342.

Nel Mondo del Infanzia. By Lino Ferriani. Milano: L. F. Cogliati, 1899. Pp. 173.

Delinquenza Precoce e Senile. By Lino Ferriani. Como: Omarini Vittorio, 1901. Pp. 460.

All these volumes are studies in criminal psychology. Mr. Lino Ferriani the author of them is a distinguished Italian judge, and all his studies are based on his practical experience of the Italian criminal classes. What he finds as characteristics of the Italian criminal cannot in all respects be generalised into characteristics of the criminal population of all countries. Just as each country produces a distinct psychological type peculiar to itself, so does it also produce a criminal type which is distinctively its own. General racial characteristics differentiate the Italian criminal from the English criminal. And these racial characteristics combined with different social conditions and social customs also differentiate Italian crime from English crime. It is probable for instance that racial character and temperament and the social customs which are to a considerable degree the outcome of them are the principal reasons why crimes of passion in the shape of homicide and assaults upon the person are more prevalent in Italy than in England. The hot and impulsive temperament of the south combined with the circumstances in which it moves, produces a type of criminal peculiar to Italy, and where the Italian school of criminal psychologists have gone wrong is in attributing to criminals as a whole the mental and moral characters which they discover among the criminal population of their own country. Before criminal psychology can formulate laws applicable to criminals as a class, it must first of all take account of the characteristics peculiar to criminals of various nationalities. It is only after this has been done that we shall be able to get at the characteristics common to criminals

of all communities. In other words it is only by the comparative method that we can ultimately arrive at a sound and satisfactory criminal psychology.

It is from the point of view of comparative criminal psychology that Mr. Ferriani's volumes are so valuable to the non-Italian student. They deal exclusively with Italian criminals. They show the workings of the Italian criminal mind. And they possess the inestimable value of being studies at first hand. Mr. Ferriani speaks of what he has heard and seen himself. His studies are almost entirely confined to offenders who have come before the tribunal over which he presides himself. This gives them a peculiar and pre-eminent value, and distinguishes them from a great deal of second-hand opinion which parades itself before the public as criminal psychology. In the criminal cases that come before him Mr. Ferriani has made it his business to go as deeply and thoroughly as he could into the character and circumstances of the offender. He has looked behind the crime at the person of the criminal. The crime is the outcome of the characteristics of the criminal personality. He has accordingly made the personality of the criminal the object of careful and exhaustive examination. The first volume on the list, entitled *Minorenni Delinquenti* is a careful and elaborate study of two thousand juveniles who have come before Mr. Ferriani in his official capacity as a judge. In the collection and presentation of his data Mr. Ferriani has had several objects in view. He has given prominence to those points in juvenile offenders which he considers would be most valuable to the psychologist, the student of sociology and the legislator. In the purely psychological part of his work Mr. Ferriani deals with the tendency to crime among juveniles and of the various mental factors which actually produce it. The examination of these factors leads him to discuss some of the more prominent mental characteristics of criminal children, such as the want of moral sense, the want of modesty, the tendency to falsehood, to cruelty, to anger, to jealousy, to vanity, to envy, to hate. He also discusses the questions of suggestion and imitation, and the effects of heredity and alcoholism on the juvenile delinquent. Crime is the result of social conditions as well as mental and physical factors, and Mr. Ferriani gives a careful description of the adverse social and economic conditions which so often lead to juvenile delinquency. The volume closes with a sketch of some of the principal reforms which in Mr. Ferriani's opinion would lead to a reduction of the proportions of juvenile crime. A work of a somewhat similar character to the first is Mr. Ferriani's *Nel Mondo del Infanzia*. It is much less elaborate in its treatment of the subject, and is intended to interest parents who have neither time nor disposition to study more scientific treatises. This volume deals chiefly with the best methods of instructing the young and preparing them for the actual duties of modern life. The author is of Victor Hugo's opinion that the true thermometer of a nation's civilisation is to be seen in the manner in which the youth of the nation is instructed and prepared for the tasks of life. In Mr. Ferriani's opinion many parents are extremely ignorant of the character and disposition of their own children, of their aptitudes and weaknesses. In the study of child character he adopts the maxim that nothing is puerile in the world of childhood. The whole conduct of a child down to the smallest details is an index of its character and temperament, and it is by this index that a parent is to be guided in the education of the young. *Nel Mondo del Infanzia* is a series of essays written at various times, and the treatment of the various matters relating to childhood is therefore not so systematic as if the book had been written with one

predominant purpose in view. But it is none the less interesting on that account. In fact it is a little volume full of wise suggestions to parents, and penetrated with a spirit of deep sympathy and solicitude for the young and helpless.

Mr. Ferriani's latest volume, *Delinquenza Precoce e Senile*, was only published a few weeks ago. It is also described by the author as a study in criminal psychology. The book is dedicated to Prof. Lombroso and is dominated to a large extent by Lombroso's conception that the criminal like the poet is born not made. Mr. Ferriani in fact goes so far as to say that in this volume Lombroso's thesis respecting the born criminal receives a new and luminous demonstration. In support of Lombroso's contention Mr. Ferriani produces evidence to show how criminal parents beget criminal children and in this fact he sees an exhibition of the laws of atavism, of morbid heredity, and of family degeneration. There is no doubt about the fact that the offspring of wretched and degraded parents are more likely to become offenders against the criminal law than the children of parents living under normal social and physical conditions. But this does not settle the question as to whether the tendency to crime is an inherited tendency born with the individual, or whether it is a tendency produced by adverse parental, social and economic conditions outside the offender, or, lastly, whether crime is a product of adverse hereditary and social circumstances acting in combination and perhaps incapable of being analysed into their respective elements. It is probable that the question of the born criminal is an insoluble one. Who can measure the extent of external influences such as suggestion, imitation, example, and so on, on the highly impressionable mind of a child? And, on the other hand, how are we to measure the action of heredity? Until these preliminary steps have been taken it is impossible in each particular instance to say to what extent a child's conduct is the result of inborn disposition and to what extent it is the outcome of circumambient conditions. And so long as we are unable to separate what has been inherited from what has been acquired we shall be unable to determine whether the born criminal exists or not. These remarks, however, do not detract from the value of Mr. Ferriani's latest work. It is in many respects his ripest production. It is full of facts, full of thought, and sheds a considerable amount of light, especially upon the somewhat obscure problem of senile crime.

Delinquenti che Scrivono is, as its title implies, an attempt to deduce criminal character from the letters of criminals and from criminal handwriting. The material is divided into several groups corresponding to the crimes to which the writers of the letters were addicted. Thus we have an examination of the letters of precocious offenders, of criminals convicted of sexual offences, of thieves and forgers, of offenders against the person. The book opens up an interesting sphere of study. But the subject is as yet too new to possess many assured results. Mr. Ferriani is, however, to be congratulated on the painstaking manner in which he has collected his documents and on the skilful deductions which he draws from their contents. *Delinquenti Scaltri e Fortunati* is explained by its title, and is an excellent discussion on clever and successful criminals, and on persons of the same type who succeed in keeping within the ordinary law. It is not a book which admits of being easily summarised, dealing as it does with vice as well as actual crime. *Delinquenti Scaltri e Fortunati* is a wonderfully clear revelation of the sombre side of modern civilisation and of the immense work which remains to be done before society is purged of its parasitic and deleterious elements. It is impos-

sible to conclude this notice without an expression of sincere thanks to Mr. Ferriani for his admirable series of monographs on the criminal population. It is very seldom that we find a writer so excellently equipped for his task, and it is to be hoped that his name will become widely known among all students of criminal phenomena outside Italy.

W. D. MORRISON.

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VII.—PHILOSOPHICAL PERIODICALS.

PHILOSOPHICAL REVIEW. Vol. ix. No. 6. **H. N. Gardiner.** 'The Early Idealism of Jonathan Edwards.' [Brief account of the notes on 'The Mind' and on 'Natural Science,' with analysis of the article 'Of Being' contained in the latter. "That which truly is the substance of all bodies is the infinitely exact and precise and perfectly stable Idea in God's mind, together with His stable Will that the same shall gradually be communicated to us and to other minds according to certain fixed and exact established methods and laws." This is not derived from Berkeley: similar ideas do not occur in him before the Siris of 1744. Edwards draws rather from Locke, Newton and Cudworth. The early metaphysics persists in the later theology.] **F. Thilly.** 'Locke's Relation to Descartes.' [In combating innate ideas Locke is combating Descartes; the Cartesians; Herbert of Cherbury, More, Cudworth, Gale; and all possible arguments in their favour. The essence of the mind is thinking: thinking, for Descartes, is consciousness: hence the mind must be conscious of what is in it, and every innate idea or truth must always be known in every mind. As there are no such ideas and truths, the mind is an empty tablet. Locke thus refutes Descartes upon the Cartesian premisses. He himself does not, of course, believe that the mind is always thinking.] **W. Fite.** 'Contiguity and Similarity.' ["A consistent definition of the law of contiguity demands that it refer solely to the simultaneous excitation of elements within the same brain; as referring to mental states, it presupposes the factor of mental activity. But a consistent definition of the law of similarity includes a mental activity which defines the kind of similarity meant; and association by similarity cannot be expressed in any known physiological terms."] **R. B. Perry.** 'The Abstract Freedom of Kant.' [In the first *Kritik* freedom is connected with the irreducible fact-aspect of any phenomenon. Freedom "is the eternal freedom to be otherwise than it is, enjoyed by the universe as a whole, and participated in consciously or unconsciously by all the members of the universe". In the *Kritik of Judgment* a man is free in the sense of having his eternal nature consciously determine his act. Kant thus "denies dual possibilities, or genuine alternatives, and substitutes the negative principle of the absence of external determination".] Reviews of Books. Summaries of Articles. Notices of New Books. Notes.

PSYCHOLOGICAL REVIEW. Vol. vii. No. 6. **H. C. Warren.** 'The Fourth International Congress of Psychology.' [Emphasises the fact that "the barriers of language were surprisingly strong". General summary of topics handled. The fifth congress will be held at Rome in 1904, with Prof. Sergi as president.] **E. Thorndike.** 'Mental fatigue.' —II. [(1) Mental fatigue in school children. Danger of confusing ability to work with readiness to work; of neglecting the practice increment; of emotional excitement; and of slight differences in the giving of tests. Tests given: multiplication, spelling, memory of figures,

nonsense syllables and letters, reproduction of forms, counting dots. "Any difference in the ability of scholars to do mental work due to two hours or more of ordinary school work without long rest, or four hours with a rest of one or two hours inserted, would have been detected by these tests": none was found. The decrease in work done during the last part of the school day is due to bad teaching. (2) Continuous mental activity, in some cases for eight hours. No impairment of mental function observable. (3) Measure of physical strength, at beginning and end of the day's work. No decided decrease of physical power observable.] **M. W. Calkins, H. Buttrick,** and **M. M. Young.** 'Wellesley College Psychological Studies: An Attempted Experiment in Psychological Æsthetics.' [Three pictures shown, by method of paired comparison, to kindergarten and older children, and to college freshmen and seniors. The first is coloured; the second has beauties of line, light and shade; the third is highly associative. General results: it is impossible to draw absolute distinctions between child and adult. Children are characterised simply by attention to parts with neglect of whole; not by any given type of preference.] **C. E. Seashore** and **M. C. Williams.** 'An Illusion of Length.' [Drawing of double and half squares to a standard vertical, of double and half horizontal lines to the same standard, and of horizontal multiples of a standard horizontal line or point-distance. The double is underestimated in all work with lines; eye-movement is a primary, contrast a secondary explanation. The illusion does not vary constantly with the size of the object.] Discussion and Reports. **C. L. Franklin.** 'The Dissimilarity in Function of the Rods and the Cones of the Retina.' [Discussion of the results of von Kries and Nagel, *Zeits. f. Psych.*, 1900. The rods are the organ for nothing but achromatic vision; colour is mediated by the cones only.] **C. H. Judd.** 'The Illusion of Deflected Threads.' [Reply to Pierce. Separation *versus* fusion of images.] **F. H. Verhoeff.** 'The Space Threshold by the Pseudoscopic Method.' [Since Stratton obtained a limen of 24″ for binocular relief with the pseudoscope, he obtained it practically by doubling his interocular distance. Hence the true limen is 48″, which agrees with former determinations.] **G. M. Stratton.** 'Reply.' [Independent work by another method gives 7″ for 24″; and the relief at 24″ holds without the pseudoscope.] **J. A. Bergström.** 'A Magnet Registration Key.' [Description and cut.] Psychological Literature. New Books. Notes.

Psychological Index. No. 7. 'Bibliography of the Literature of Psychology and Cognate Subjects for 1900.' [Issued in March, 1901. Contains 2,627 titles: the Index for 1899 had 2,584. Omissions are obvious, but with the early date of issue could hardly have been avoided.]

American Journal of Psychology. Vol. xi., No. 4. **N. Triplett.** 'The Psychology of Conjuring Deceptions.' [(1) The origin of conjuring: the instinct to deceive; mimicry and death feigning; deceptions in children; priesthood, and the relation of deception to conjuring. (2) Modern conjuring: classification of conjuring deceptions; analysis of typical tricks. (3) The preparation of the conjurer. (4) Psychological justification of the rules and practices of the conjurer: attention (gesture and 'patter'); perception and apperception; suggestion and association (suggestions of repetition, of confidence and obedience); suggestion and the law of economy. (5) Sociological and pedagogical observations: interest in conjuring deceptions; law of diminishing intensity of feeling; motor training; responsiveness of the audience.] **S. S. Colvin.** 'The

Fallacy of Extreme Idealism.' ["We cannot view the universe from the point of extreme realism, which posits the thing-in-itself, an unthinkable and useless nothing. Neither are ideas as such capable of building a universe. . . . The only thing that we can attach truth to is that which is causally active. . . . Force, energy, activity, will . . . is the most fundamental fact in our experience. . . . Being is that which acts, and ultimate reality is a system of ordered activity, in which every part is related to every other part."] **E. J. Swift.** 'Visual and Tactuo-muscular Estimation of Length.' [Sight is the more accurate; and visual memory is, for a short time at least, more accurate than tactual-motor. In judging short lengths, there is a tendency to underestimation both in sight and in touch. Visual judgments are regular, tactual-motor irregular.] **M. Meyer.** 'Remarks on C. Lloyd Morgan's Paper: "Relation of Stimulus to Sensation".' [Corrects Morgan's ideas of Weber's law, and criticises his procedure.] **F. H. Saunders** and **G. S. Hall.** 'Pity.' [Questionnaire material. (1) Pity in real life: hunger; cold, shelter, clothing; weakness, innocence; sickness, deformity, death; poverty, vice, crime; fire, water; spinsterhood, old age; sympathy with animals, plants, inanimate nature; pathetic effect of natural sounds. (2) Pity in art and literature: music, fiction, the life of Christ; depression at twilight; autumn; regret, self-pity. (3) Psychological: pedigree of pity; symptomatic effects; man *vs.* woman; complexity of the psychosis. (4) Educational: excessive and morbid pity; the art of comforting; specialisation of pity; pity fetiches; irradiation and diffusion of pity; friendship and love; personal experience in grief; imagination as a factor in pity; expression of pity; 'pitying aright' compared with fearing aright, being angry aright. "Pity has its highest office in removing the handicaps from those most able to help man to higher levels. . . . The mission of pity in the world to-day is to minister to the needs of élite youth, at the stage of later adolescence, when their development is so easily arrested, but at that age when the prolongation of educational incentive and opportunity would give them careers in the upper stories of human endeavour, where both need and service are greatest."] Psychological Literature. Books received.

International Journal of Ethics. Vol. xi. No. 2. **D. G. Ritchie.** 'War and Peace.' [We must always reckon with the possibility of war, which is as defensible morally as the forcible repression of domestic crime. In estimating the justice of wars we cannot rely on any abstract rule, but must ask: Which of the conflicting forces was making for constitutional government and for social progress? War to get empire may be justifiable, if the resulting Empire be a higher type of commonwealth than the small communities absorbed thereby. The termination of war may be brought about by a federation of European Empires.] **J. J. Chapman.** 'The Unity of Human Nature.' [The moral conduct of every individual influences all the rest of the world. Hence it is important that each individual should combat the forces of evil. To compromise with evil in one's youth jeopardises one's moral future.] **W. R. Sorley.** 'Henry Sidgwick.' [A shortish biographical and critical appreciation.] **F. H. Hayward.** 'The True Significance of Sidgwick's *Ethics*.' [Sidgwick adhered to the English tradition of empiricism. His special merit is his honest and searching criticism; his one failing is his comparative neglect of Green's idealism. He is very eclectic and in particular has borrowed largely from Kant, especially in his treatment of Reason. While formally adopting a species of Hedonism, Sidgwick has frankly exposed its contradictions, and thereby done a great service to Idealism.] **Tokiwo Yokio.** 'Education in Japan.' [An account of

Japanese education, with statistics and suggestions for improvement. A system of ethical teaching is the chief desideratum.] **G. M. Stratton.** 'A Psychological Test of Virtue.' [A criticism of Prof. Dewey's test which is that an action is morally good when it springs from our whole nature. The test is true, but it is not psychological. For it is not psychology, but ethics, that can decide what our "whole nature" is.] **F. J. Gould.** 'Children's Ethical Classes.' [In such classes the sexes should be mixed. Their deep emotions should not be worked on. The teacher should be adequately trained. The co-operation of the parent should be secured. The child's imagination and moral judgment should be strengthened. The inspiration of moral instruction should be the idealisation of humanity. We greatly need a collection of suitable materials for teaching. The instruction should be dramatic in form, suitably graded for pupils of different ages.] **J. A. Nicklin.** 'The Greek View of Life.' [The Greek view is best represented by Aristotle's *Ethics*, who makes happiness the end of life, but a happiness whose chief constituent is wisdom. Such a view gives us the highest idea of the gifts of the Greek nation: its failing is that it is satisfied with human happiness, whereas Christianity aspires after the unattainable.] Book Reviews.

Revue Philosophique. January, 1901. **V. Brochard.** 'La Morale Ancienne et la Morale Moderne.' [It is a mistake to suppose that modern ethics, with its central idea of an external command, has *superseded* the classical systems, whose aim was the determination of the Good: rather the latter, depending on Reason alone, are the foundation of true Ethics, while the former, in so far as it rests on religious conceptions, is a more popular expression of the same fundamental idea.] **F. le Dantec.** 'La Définition de l'Individu.'—I. [Biology cannot answer the question of Polyzoïsm, which becomes most important when it refers to man, "Is man an individual or a colony of individuals?" until it has a fixed definition of "individual". This is given neither by indivisibility, nor by community of origin: the individual is "a living mass whose form is hereditarily obligatory".] **Sokolov.** 'L'Individuation Colorée.' Notes et discussions. **P. Tannery.** 'Sur la question de l'infinitude de l'univers.' Revue critique. Analyses et comptes rendus. Revue des périodiques étrangers. February, 1901. **F. Pillon.** 'La Mémoire affective: Son importance théorique et pratique.' [Emotional memory is distinct from new emotion caused by revived ideas, and exists in various degrees of concreteness. Moral and religious education should take account of it, for the tenacity with which ideas are held depends on their power of reviving emotion.] **Manxion.** 'La vraie Mémoire affective.' [True emotional memory depends only on association between the original causes (ideal or sensational) and their accompanying emotional state, and differs from new emotion, whose intensity depends on the vividness of the representation of the former causes.] **F. le Dantec.** 'La Définition de l'Individu.'—II. [Hereditary transmission of acquired characteristics is necessary for the individualisation of a group of cells. The cells forming a pluricellular individual are different from apparently similar ones forming a colony, the form of their grouping, as well as their separate natures, being determined by heredity: hence the question of Polyzoïsm becomes that of polyzoïstic *origin* only, *viz.*, "can a pluricellular individual arise from the progressive individualisation of what was originally a colony?" The hypothesis that it can seems probable.] Revue générale. Analyses et comptes rendus. Revue des périodiques étrangers. March, 1901. **Dr. Grasset.** 'Le Vertige: étude physiopathologique de la fonction

d'orientation et d'équilibre.' **Ch. Dunan.** 'Les Principes de la Morale. —I. Le Souverain Bien.' [Ethics rests on Metaphysics: for only by a theory, not empirically attainable, of the relation of man to man and of the individual to the universal can altruism and egoism be reconciled. The condition of perfect existence for each individual is union with the whole of creation. True self-love, which is not opposed to love of others, demands the recognition of a hierarchy of functions and of pleasures.] Discussions. **R.-P. Sertillanges.** 'La Morale ancienne et la Morale moderne.' **Evellin** et **Z.** 'Sur l'Infini Nouveau.' Analyses et comptes rendus. Revue des périodiques étrangers.

Zeitschrift für Psychologie und Physiologie der Sinnesorgane. Bd. xxiv., Heft 5. **A. Netschajeff.** 'Experimentelle Untersuchungen über die Gedächtnissentwickelung bei Schulkindern.' [Experiments (687 children, nine to eighteen years of age) on visual impressions, sounds, numbers, three-syllable words denoting visual objects, similar words denoting sounds, similar words denoting objects of the cutaneous, temperature and muscular senses, similar words denoting affective states, and abstract words, supplemented in the case of 350 of the older children by a short questionary. Results: memory improves with age; the meaning of words is a condition of their retention; there is an analogy between the modes of development of the number and the abstract-word memories; the extensive development of the various memories differs (objects and affective words are best, numbers worst remembered). Further, boys have a better memory for real impressions, girls for numbers and words; the greatest sex difference obtains in the period eleven to fourteen years of age. Children of visual and motor type have a better average memory than other children of the same age and school; those of the auditory type fall below the normal. The influence of word-meaning is greatest in memories of the visual type.] **O. Raif.** 'Ueber Fingerfertigkeit beim Clavierspiel.' [The second and third fingers can make five or six, the other fingers four or five strokes in the second; the practised trill has eight to twelve tones in the second, each finger making four to six movements. Piano players do not surpass other persons in rapidity of finger movement. Experiments show that the rate of movement of the separate fingers does not increase with practice: what is wanted in piano playing is, therefore, not finger-readiness but thought-readiness.] Literaturbericht. Bd. xxiv., Heft 6. **C. Ritter.** 'Ermüdungsmessungen.' [Griesbach's æsthesiometric method and the arithmetical method condemned by Ebbinghaus are rejected; Ebbinghaus's combination method is left untested from lack of opportunity. The method of dictated words is available: dictation of numbers and of sentences is to be rejected. The method of cancellation of determinate letters and words in like printed texts is also available. Two attempts were made to utilise the school work itself: the Greek-exceptions hour was divided into two periods, and short sentences of equal length and difficulty were laid before the pupils for memorising. The result in the first case is doubtful, in the second promising. Remarks on other attempted methods, and on individual (as distinct from class) tests.] **L. Edinger.** 'Hirnanatomie und Psychologie: Entgegnung an Herrn E. Storch.' [The author had not intended to approach psychology by way of anatomical method or result, but merely to show that and how anatomy and physiology may some day prove useful to the psychologist. Literaturbericht. Namenregister. Bd. xxv., Heft 1 und 2. **S. Witasek.** 'Zur psychologischen Analyse der aesthetetischen Einfühlung.' [Attempts to show that æsthetic sympathy (*Einfühlung*) "consists essentially in an ideation of psychical facts, for the most part emotional

in character"; *i.e.*, defends the theory of ideation as against the theory of actuality. (1) Proofs that ideation of psychical facts ('thinking of a thought') is possible; that the distinction between ideas of perception and ideas of imagination holds for it as for ideation of physical facts; and that ideation, in the one case as in the other, may be representative (pictorial) or symbolic (*anschaulich* or *unanschaulich*). (2) Laws of the origination of ideas (perception; imagination, due to association; voluntary action, volitional association or apperception; objects of a higher order, consolidated contents or form qualities) and of feelings (ideas and judgments serve as the presupposition, *Voraussetzung*, of feelings). The two functions of the presupposition of feeling: the phenomenal, shown when we are glad *of* something, or pleased *with* something; and the causal, shown when we can refer the feeling to the presupposition as we refer the second member of an association to the first. What, then, is the presupposition of the feelings which the theory of actuality assumes? Analysis of instances: detailed consideration of the 'reading oneself into' (*Sich-hineinversetzen*) the position of the æsthetically considered personality, and of the 'transference of feeling' to the contemplated object (Stern). In both cases the actuality theory breaks down: the train of ideation set up by the æsthetic object (always including the idea of feeling) furnishes the explanation of æsthetic sympathy. (3) The mechanism of sympathy in terms of the theory of ideation. This section raises and answers the questions: What is the object of æsthetic sympathy? What are the psychical facts that constitute sympathy? What are the data of perception that arouse sympathy? What are the psychological laws under which this arousal takes place? Noteworthy, but too long for summary, is the discussion of the æsthetic effect of music. The general result is that *Einfühlung* obeys the laws of ideation: we thus have positive confirmation of the negative result just reached, that it does not obey the laws of feeling. (4) Sympathy is not identical with the æsthetic attitude at large. "Where sympathy co-operates in the production of the æsthetic attitude, it is, as representative ideation of psychical facts, presupposition of the æsthetic feeling."] **E. Berger.** 'Ueber stereoskopische Lupen und Brillen.' [Impressed by the utility of binocular vision in such instruments as the stereoscope, the opera glass, the double telescope, etc., and by the damage done to vision by the single watchmaker's lens and similar appliances, the author set to work to devise a double lens which should be useful in delicate mechanical work. He gives a full optical discussion of the double lens, showing, among other things, its power to correct astigmatism; and also recommends stereoscopic spectacles, with decentred concave and convex lenses, for presbyopia, myopia and hypermetropia. Diagrams of the course of the light rays are given throughout.] **M. Straub.** 'Die normale Refraction des menschlichen Auges.' [Variation of refraction, except at the beginning and end of life, is apparent only, and is caused by a tonus of the ciliary muscle. Refraction is subject to great individual variation in infancy, but tends towards a constant value as time goes on. Nature strives towards an ideal refraction (that of emmetropia), correcting the deficit of refraction (normal hyperopia) by tonus of the ciliary muscle. This emmetropisation is (apart from pathological cases, *i.e.*, myopia) more constant in the higher than in the lower social classes.] **F. Kramer** and **G. Moskiewicz.** 'Beitrage zur Lehre von den Lage- und Bewegungsempfindungen.' [(1) *Experiments on the position of the hand.* The effect of practice is very great; a point that is freely chosen can be found more exactly than a prescribed point; interference with muscular tension has no appreciable

influence on the accuracy of result; on the other hand, accuracy is seriously affected by the position of the point in regard to the body. Symmetrical placing of the hands is possible only within a region of easiest positions. (2) *Experiments on movement.* (*a*) Arm movements of different length show (average error and right and wrong cases) a constancy of the relative difference linen, varying in the individuals tested between the limits (approximately) one-tenth and one-twentieth. (*b*) Influence of position and direction of the extent to be reproduced upon the accuracy of reproduction. Repetition and variation of Loeb's experiments; confirmation and generalisation of their results. "That extent of movement is the shorter, which in the judgment of all the observers is the less easy or comfortable." The judgment of equality of distance depends upon the equality of impulse given (not in the sense of innervation sensation, but in that of "the idea of the necessary expenditure of energy which precedes any given movement") and of time elapsed; in the case of successive movements it depends further upon preadjustment of attention.] Literaturbericht. Bd. xxv., Heft 3. **Th. Lipps.** 'Psychische Vorgänge und psychische Causalität.' [An elaborate and closely reasoned paper, the burden of which is that psychical causality can be predicated, not of conscious contents, but only of the unconscious 'psychical processes'. "The conscious contents that constitute the life of consciousness are: sense-contents and feelings; . . . the ideational contents corresponding to them; the modes of temporal and spatial existence, temporal and spatial relations, forms, etc., perceived or ideated; and the directly experienced relations of the objective conscious contents to the ego, or *vice versâ:* nothing more. On the other hand, the unconscious factors that constitute the causal psychical life-complex are the sense-processes and idea-processes; the real temporal and factual relations of these to one another; the modes of their interconnexion, or associations; and lastly the psyche itself, with its general states and inherent memory-dispositions. No one of the elements of the life of consciousness enters as a factor into this causal interconnexion; and no one of these factors of the psychical causal interconnexion can ever pass over into the life of consciousness. The psychology which transcends description and proceeds to explanation constructs a real psychical life-complex out of these real factors. In doing this it makes the conscious life . . . causally intelligible, in the only possible sense of this phrase. That is the task of psychology as explanatory science."

The paper begins (1) with a reference to hallucinations, which show the necessity of 'supplementing' in psychology, of a passage beyond the phenomenal to the real. Such supplementing is given with the idea of mind or brain, as organised or endowed thus and thus, and furnished with memory traces; and also with the mention of physiological stimuli. But more is wanted. (2) Physiological materialism gets its causal connexion by way of brain processes: but these are physical, and the vehicle of psychical causation must be psychical. We therefore substitute 'psychical processes' (real and unconscious) for the physical. "The psychical life-complex is an interconnexion of the psychical processes, and only indirectly of conscious contents. . . . It is an interconnexion of the real; and this is the same thing as saying, of the unconscious." (3) But we need not appeal to physiology. The theory that conscious process proceeds from conscious process is untenable: every physiological stimulus, every effect of a disposition or a memory-trace overthrows it. Conscious processes can never be more than ideal, phenomenal, existent-in-consciousness; they cannot therefore have real predicates. On the other hand, the psychical life-complex, which is

subject-matter for psychology, is real, existing whether I am conscious of it or not. (4) Let us now take the real and the phenomenal together. The latter shows interconnexion and mutual conditioning. The physicist derives from it, for his real, spatial and temporal connexions; the psychologist, for his real, temporal connexions only. Both reals are, further, causally interconnected. Causality is at first nothing but a real uniformity; but we later read into it the mutual conditioning of the phenomenal. (5) Here we have the difference between the reals of the physicist and the psychologist: neither regards all conscious contents as mere signs or symbols, but the psychologist (taking over time alone) does this in greater degree than the physicist. (6) This section is devoted to a more detailed consideration of the psychical (unconscious) processes. "We give this name to the processes making towards the existence of sense-contents and their corresponding idea-contents which (and so far as they) join together to form an unitary psychical life-complex, *i.e.*, stand throughout in direct functional relation to one another or with all processes of like kind." This unity of the psychical life-complex is termed attention. (7) The instance of the ticking of a clock, which I do not hear while working, but hear as soon as my attention relaxes, leads to the distinction of a 'psychical' and a 'conscious limen'. (8) This case might be explained by appeal to grades of conscious clearness: not so the case that I remember not to have heard the ticking. Even the simile of the conscious field of vision can be pressed into our service: for the field, with its conscious point of regard, is only a portion of the sum-total of conscious possibilities at the moment: there are countless psychical processes, making towards conscious contents, which do not call any conscious content into existence because they do not strike our mental eye. But 'degrees' of consciousness are, in any case, unthinkable; nor is there any such thing as a 'becoming' conscious. (9) This section appeals to further facts: an idea calls up a particular idea out of the many associated to it; the first part of a name is given, and I complete it; reaction-time is affected by practice and fatigue; I analyse a clang into its partials; I find a star, in a cluster, that I pass over if it shines alone, etc. All these cases must be explained in terms of the psychical processes, not of the relative clearness of conscious contents. (10) The same thing is true of associations, experiential and by similarity; and, indeed, of every consciousness of likeness of kind, similarity, identity: psychical causality belongs only to the unconscious psychical processes.] Literaturbericht.

PHILOSOPHISCHE STUDIEN. Bd. xvi., Heft 4. **W. Wirth.** 'Der Fechner-Helmholtz'sche Satz über bagative Nachbilder und seine Analogien.'—I. [Helmholtz lays it down that the intensity of the sensation aroused over a fatigued area of the retina is a function of the intensity of the reacting light. "Fatigue of the *Sehnervsubstanz* affects the sensation aroused by new incident light in approximately the same ratio as if the objective intensity of the light had been decreased by a determinate fraction of its magnitude." The author shows the relation of this proposition to Fechner's parallel law, and names it the 'Fechner-Helmholtz law'. The object of the paper is to test its validity by quantitative measurement. Quantitative work on the negative after-image: *cf.* Müller, Fechner and Helmholtz; Schoen; von Kries; Martius. Critique of Martius' method and hypothesis. New experiments: colourless after-images (pigments) from the Marbe colour-mixer. "Over a wide middle zone, the value of the after-image stands in an approximately constant relation to the absolute brightness of the reacting surface," *i.e.*, the Fechner-Helmholtz law is valid. Episkotister experiments: the change

of illumination over the whole field of vision and the settings for subjective equality are effected at one and the same time by variation of the Marbe apparatus; observation of the disappearance of the after-image effect; comparison of a coloured after-image with the after-image of a corresponding brightness-difference. General confirmation of the law.] **F. Krueger.** 'Beobachtungen an Zweiklängen.'—II. [Intervals from octave to twelfth, and from twelfth to double octave. Introspective results: the process of analysis; the estimation of partial tones (temporal, qualitative, intensive); the apprehension of beats; optical and other associations; the affective impression. Objective result: "from the connexion of two simple tones there result, over and above the summation-tone, as many as five difference-tones of various orders, whose pitch is to be calculated by subtracting the one from the other, first, the pitch-numbers of the primaries, and then, in order, the two smallest vibration-numbers already obtained. These difference-tones bear precisely the same relation to one another and to the primaries that the primaries bear to each other; this is shown, *e.g.*, in the matter of mutual intensification, when several of them coincide or lie near together, and in the matter of the beats and intermediate tones which arise in this second case."]

PHILOSOPHISCHES JAHRBUCH. Band xiii., Heft 4. **C. Gutberlet.** 'Teleologie und Causalität.' [This is the first of two articles, in which the writer, pointing out that the discovery of any plan of evolution implies not only our intelligence that discovers it, but another intelligence by which it has been made, proceeds to attack the theory that teleology is mere causality reversed. This would be too general a view of teleology. The necessary dependence of a on b, and of b on c, does not by itself give us b as a means whereby c produces b. *An eye evolved, sight results*, does not imply that *sight was intended by the evolution of the eye.*] **J. Baur.** 'Die actuell unendliche zahl in der Philosophie und in der Natur.' [The writer continues, against the majority of Scholastics, to maintain the actuality of an infinite number, both as a philosophical possibility and as existing in nature. After answering a series of objections, he affirms infinite time, and the infinite of space, and, firstly, the infinitely small. There are no direct, but many indirect proofs of this.] **E. Rolfes.** 'Neue Untersuchung über die platonischen Ideen.' [The writer analyses various works of Plato in order to prove, not only that his "Ideas" are self-subsisting, but that their subsistence is, according to Plato, one with the existence of God, not independent of Him. Stallbaum's argument to the contrary contradicts his own standpoint, and he himself says that Plato's Ideas are the thoughts of God.]

VIII.—NOTES.

HUMAN SENTIMENT WITH REGARD TO A FUTURE LIFE.

The American Branch of the Society for Psychical Research has recently issued an interesting *questionnaire* (part of which is printed below) to determine the feelings with which the possibility of a future life is actually regarded by educated adults at the present day. From the Society's point of view the question is of course one of primary importance, inasmuch as the emotional bias enveloping the subject must form a (hitherto incalculably) distorting and thwarting influence in most of the Society's investigations. And experience has convinced some at least of the authorities of the Society (the English branch has not yet officially taken up the inquiry) that while there is no exact knowledge as to the various forms of human bias, there is grave reason to doubt whether it is actually such as is commonly supposed.

But though the inquiry has in this way been suggested by a practical need, it is, of course, in itself scientific in character, and as such should appeal strongly to all students of human psychology. And it may be added that it seems well designed to throw light also upon many philosophic questions whose interest is not solely psychological.

For instance it should afford a definite test of the at present much discussed doctrine of the existence of a 'will to believe' (and to *disbelieve*), as accounting for the beliefs actually held. The answer to question II. should also throw much light on the ethical questions as to the value of life.

Indeed it may already be affirmed that many interesting, valuable and somewhat surprising answers have been obtained. Of course, however, to make the results thoroughly representative and trustworthy, a very large number of answers must be collected.

Hence it is hoped that psychologists and philosophers generally will consent to assist in collecting answers. Copies of the *questionnaire* may be obtained on application to Dr. Hodgson or myself, and *European answers should be returned to me* (at Corpus Christi College, Oxford), *American to Dr. Hodgson* (at 5 Boylston Place, Boston, Mass.).

F. C. S. Schiller.

N.B.—*All names will be regarded as strictly confidential.*

Questions.

I. Would you prefer (*a*) to live after 'death' or (*b*) not?
II. (*a*) If I. (*a*), do you desire a future life whatever the conditions might be?

(*b*) If not, what would have to be its character to make the prospect seem tolerable? Would you, *e.g.*, be content with a life more or less like your present life?

(*c*) Can you say what elements in life (if any) are felt by you to call for its perpetuity?

III. Can you state *why* you feel in this way, as regards questions I. and II.?

IV. Do you NOW feel the question of a future life to be of urgent importance to your mental comfort?

V. Have your feelings on questions I., II. and IV. undergone change? If so, when and in what ways?

VI. (*a*) Would you like to *know for certain* about the future life, or (*b*) would you prefer to leave it a *matter of faith?*

The name, sex, age, nationality and profession of those who answer are asked for.

REPLY TO MR. HERBERT SPENCER'S NOTE IN "MIND," JANUARY, 1901.

In the January number of MIND, under heading "Notes and Correspondence" (p. 144), is a contribution by Mr. Herbert Spencer, commenting on my paper which appeared in that journal for October, 1900.

It appears that Mr. Spencer considers that I have incorrectly represented him "as regarding our consciousness of Space as evolved from our consciousness of forces".

Whereas, actually, the idea of Space [Void] is derived from the occasional consciousness of the absence of resistance [or absence of force], as *contrasted with* our consciousness of force or of resistance, which (latter) is synonymous with our consciousness of Matter.

This statement of the case (as I would word it) substantially accords with the teaching contained in the *First Principles*, as I interpret it. Therefore there could have been no intention in my paper to contravene the *First Principles* in relation to this point.

Indeed, in my October paper, which Mr. Spencer criticises, it is expressly stated: "There is no means of applying forces to Space" (p. 524 of MIND for October). And I suggested that it might be expedient on this account, not to class Space in the same category as Matter or material objects, as some do, it seems.

My critique related to a "*particular theory*" of Space suggested by Mr. Spencer in his *Principles of Psychology*, vol. i. It will be best to requote the passage in my paper Mr. Spencer demurs to, and which he himself cites. The passage is as follows:—

"In his *Principles of Psychology* . . . Mr. Herbert Spencer ventures to suggest a particular theory, which makes space and time the resultants of a particular transformation passed through, where force is therefore (by implication) concerned, just as if it were a case of colour or sound. . . . If Space and Time be not resultants of force-action, may not this constitute some reason for regarding them as absolutes?" [quoted by Mr. Spencer in MIND for January].

Mr. Spencer says he is "amazed by these statements". But I think it may be made evident that the critical remarks I ventured were justified, if this be not already clear to some from the original wording of my paper.

For what does this theory of Space in the *Principles of Psychology* involve? Mr. Spencer's own words are:—

"There is some ontological order whence arises the phenomenal order we know as Space" (*Principles of Psychology*, third edition, vol i., p. 227).

In definite language, this can evidently only mean that something unknown (an "ontological order," or absolute existence) acts—acts therefore by force[1]—on our consciousness, "whence arises the phenomenal order we know as Space". Without force, there obviously can be no action or consciousness, involving change. Force, in fact, has been well characterised as that cause which produces change.

A "phenomenal order" or phenomenon [which we call "Space"] is then substantially held by Mr. Spencer to "arise" as a resultant derived from the interaction between some unknown absolute existence, and the force of our consciousness. Space is then here considered to be a transfigured result, evolved out of some unknown absolute.

But if so, my critique must be rationally justified; which represents Mr. Spencer in this *particular theory*—"as regarding our consciousness of Space as evolved from our consciousness of forces".

For of what here are we conscious, according to Mr. Spencer? Every cause which acts on consciousness in such a way as to produce a decided effect of change as a result [called here a "phenomenal order" by Mr. Spencer], may, it is evident, be classed as a "force". Here some force due to an "ontological order" or absolute existence (as a cause) acts on our consciousness [according to Mr. Spencer] and generates "the phenomenal order we know as Space"—as an effect or resultant. Is not this effectively to say that our consciousness of Space is "*evolved from our consciousness of forces*"? Yet Mr. Spencer demurs to the passage in my paper of October, 1900 (in MIND), which gives this interpretation to his words in the *Principles of Psychology*. I fail therefore to see the justification for Mr. Spencer's singling out this particular point in my paper for criticism in MIND; while he passes over without any comment other reasoned-out conclusions in the same paper.

Mr. Spencer's Note was welcome, however, for divers reasons, not excluding the one that truth tends to establish itself (it is said) by criticism.

S. TOLVER PRESTON.

[1] Or which acts by the *absolute* correlative of the force we know (which implies the same thing). Or—to quote Mr. Spencer's words—"We are irresistibly compelled by the relativity of our thought to vaguely conceive some unknown force [in the absolute, Mr. Spencer means] as the correlative of the known force" [in the relative] (*First Principles*, p. 170).

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